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SYRUPUS ALTHÆÆ.

By F. W. Haussmann,

Research Committee E, Pharmacopœia Revision.

The desirability of a formula for this syrup, which would furnish a preparation possessing greater stability, has been expressed by American as well as Continental pharmacists.

To the former the present official cold process is extremely unsatisfactory, and almost every step in the course of preparation has been subjected to criticism.

Prominent objections, as pointed out by different writers, are the short time directed for macerating the root, the neglect of making allowance for the amount of menstruum absorbed by the althæa and consequent failure of dissolving all the sugar in the strained liquid.

By far the greatest difficulty which confronts the pharmacist, lies however, in the instability of the syrup.

The Pharmacopœia of 1880 directs recent preparation which, if the time necessary for completion is considered, is impracticable.

The present Pharmacopœia omits directions for recent preparation, but recommends the syrup to be kept in filled bottles in a cool place.

To secure greater stability the addition of 10 per cent. by volume of glycerin is ordered.

It is, nevertheless a fact, that in warm weather the syrup will rapidly decompose, and in not a few instances fermentation takes place before the syrup is even completed.

Stability of a pharmaceutical preparation in the hands of the con-

sumer is equal in importance to its keeping qualities in the shop bottle of the dispenser.

On standing a short time the cloudy syrup will be found to contain a mucilaginous deposit, which appears to be the direct medium of inducing fermentation.

To insure greater stability of the syrup, the whole or a part of the mucilage must therefore be removed.

This would, however, involve the question if the mucilage is of such signal importance, that its presence is absolutely necessary to the therapeutical value of the syrup.

Experiments conducted by the writer and extending over two years, show that a stable preparation can only be produced by removal of the mucilage.

Addition of glycerin is practically valueless as long as cold preparation with presence of the mucilage is directed.

The German Pharmacopœia, like the U.S.P., directs cold infusion of the althæa in a weak alcoholic menstruum.

The addition of alcohol is necessary to lessen the liability of fermentation in the infusion in warm weather.

The time of maceration should also be increased from one to three hours.

Up to solution of the sugar in the infusion, the working formulas of the United States and German Pharmacopœias coincide.

The former at this point directs the sugar to be dissolved by agitation without heat, while the latter directs the syrup to be heated to the boiling-point with filtration of the syrup, thus removing a part of the mucilaginous principles.

That this formula is not satisfactory to German pharmacists is demonstrated by the suggestions for improvement occasionally published. Most authors recommend clarification of the mucilage, preparation of the syrup by means of heat, and removal of the scum from the boiling syrup.

Prominent among these modifications is a process recommended by Gesche, published in the Proceedings of the A. Ph. A. of 1895.

This consists in preparing the infusion by the cold process, and evaporating the same to definite volume.

Alcohol is now added to precipitate the mucilage, the mixture filtered, made up to a certain volume with water, and the sugar dissolved by heat.

For practical purposes this method is too tedious, and may be modified without resorting to evaporation.

Dieterich clarifies the infusion by means of paper pulp, dissolves the sugar in the liquid by means of heat, and removes the scum from the boiling syrup.

This formula, as published has the disadvantage of not directing a definite weight or volume of the finished syrup.

After a number of trials the following formula was found to furnish a syrup which will not ferment, and possesses the flavor of the althæa.

Specimens, prepared over a year ago, and exposed to all temperature conditions, have retained their original appearance, flavor and consistence.

SYRUPUS ALTHÆÆ.

Althæa, cut into small pieces	50 grammes.
Alcohol	30 c.c.
Sugar	750 grammes.
Water, a sufficient quantity to make	1,000 c.c.

Wash the althæa with cold water, then macerate it with 400 c.c. of water, previously mixed with the alcohol during three hours, stirring frequently and strain without expression.

Heat the infusion to boiling, add 10 grammes of purified talcum, and filter while hot, passing a sufficient quantity of boiling water through the filter to measure 400 c.c.

Add the sugar to the filtrate, heat to boiling, remove the scum and strain. When cold add a sufficient quantity of water to make the syrup measure 1,000 c.c.

Keep the syrup in completely filled bottles, in a cool place.

Of the several methods experimented with, none furnished as satisfactory a preparation as the one above.

Filtration of the hot infusion without talcum yields a cloudy filtrate, and consequently an inferior syrup, liable to ferment.

Precipitated calcium phosphate, employed in place of talcum, is also unsatisfactory, as larger quantities are required, and a somewhat cloudy filtrate results.

Should it be found necessary for the Pharmacopœia to retain the present formula, the syrup, prepared by the above process, will be found a decidedly more satisfactory preparation for counter sale.

SYRUPUS ACACIÆ.

BY F. W. HAUSSMANN,

Research Committee E., Pharmacopœia Revision.

This syrup possesses the disadvantage common to all preparations combining saccharine with mucilaginous principles, of turning sour on standing.

Many pharmacists, therefore, prefer to prepare it extemporaneously, and a formula, which can be manipulated so as to furnish the syrup in reasonably short time is desirable.

Some Continental pharmacopœias have dropped syrup of acacia altogether, leaving it to the judgment of the dispenser to select the method of preparation when ordered.

To American pharmacists the present official process is unsatisfactory.

Besides the time required for the preparation of the mucilage, it furnishes the anomaly of preparing an unstable preparation from another equally liable to decomposition.

Pharmacists who are compelled to keep the syrup on hand, prefer the formula of the Pharmacopœia of 1870, which consists in dissolving the sugar in a previously prepared mucilage by means of heat.

Others resort to the shortest of all methods, that of rubbing the powdered gum with syrup.

Due to the avoidance of heat, the present official syrup possesses the advantage of being transparent.

No formula for rapid preparation can, however, be based upon the official process, as preparation of the mucilage requires too much time for practical purposes. Syrup of acacia cannot be expected to keep indefinitely.

A formula is therefore required which does not lay claim to stability as much as ready manipulation.

The writer made extensive experiments with powdered acacia, with the object of elaborating, if possible, an easily manipulated formula. Objections to the use of powdered gum are the impossibility of obtaining a clear preparation and the development of a disagreeable musty odor on standing.

The latter was noticed in every syrup prepared from powdered gum, and its use was therefore abandoned.

Granulated gum was substituted, with better results.

The point to be observed is to procure an article of good quality, as the color of the finished syrup is influenced thereby. The following formula can be quickly manipulated and furnishes a syrup equal to that of the 1870 Pharmacopœia. When first prepared, it is somewhat cloudy, soon becoming clear, but does not possess the brilliant transparency of the official syrup.

SYRUPUS ACACIÆ.

Acacia, granulated	8·5 grammes.
Sugar	20 "
Distilled water	25 c.c.
Syrup, a sufficient quantity to make	100 c.c.

Mix the sugar with the acacia and add to the distilled water, previously warmed in a capsule.

Stir until dissolved, continuing a gentle heat. Finally add a sufficient quantity of syrup to make the syrup measure 100 c.c.

THE ESTIMATION OF NITRATES AND AMMONIA IN WATER.

By Frank X. Moerk.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, March 21, 1899.

The quantities of chemicals which have to be determined in water analyses are, as a rule, so minute, that the employment of the usual methods of quantitative analysis means the evaporation of large quantities of the samples to obtain suitable quantities of residue, hence, it is not surprising that within recent years delicate colorimetric tests have largely been made use of, particularly in the estimations of the heavier metals and of the nitrogen-containing compounds like the nitrites, nitrates and the free and albuminoid ammonia.

ESTIMATION OF NITROGEN AS NITRATES.

The method generally used, depends upon the formation of aromatic nitro-derivatives, which have intense coloring power, especially in alkaline solutions; the manipulation used by the writer for some years is as follows: 10 c.c. of the sample are evaporated to dryness in a small porcelain capsule on a water-bath; the residue is thoroughly mixed with 1 c.c. phenol sulphonic acid (made by

adding 37 grammes sulphuric acid to a mixture of 6 grammes pure phenol and 3 grammes distilled water) and heated on the water-bath for five minutes; the liquid is then diluted with 5 c.c. water, an excess of water of ammonia added, drop by drop (about 5 c.c.) and the alkaline solution finally suitably diluted for comparison with a standard solution. This standard solution I have always made from a $\frac{N}{100}$ solution of potassium nitrate (1·010 grammes of the fused salt per litre); 1 c.c. of this solution is evaporated to dryness and the residue treated as above, finally diluting to 100 c.c. (each cubic centimetre of this solution represents 0·0000014 gramme nitrogen as nitrates). It will very often be found necessary to dilute a portion of this standard solution, so as to match the color of the solution obtained from the sample under examination.

The phenol-sulphonic acid and the standard solution keep very well if protected from light; samples at least seven years old have been examined recently and were found practically unchanged; the the phenol-sulphonic acid has deposited a considerable quantity of a white precipitate, but by agitation can be incorporated with the fluid portion and measured without difficulty.

The only objection to this method of estimating nitrates is the difficulty experienced at times in matching the color, and for a long time no modification could be devised which satisfactorily enabled the color comparison.

Several years ago, while working with salicylic acid, the idea suggested itselt to use a saturated solution of salicylic acid in sulphuric acid instead of the phenol-sulphonic acid; various samples of water examined with these two reagents indicated the superiority of the salicylic acid reagent because of a deeper colored solution and the decreased number of cases in which difficulty was experienced in the matching. Several months ago, however, a sample of water was examined, which with phenol-sulphonic acid, practically showed no nitrates, but giving with the salicylic acid reagent an intense coloration which moreover was very difficult to match. An examination disclosed the presence of manganese and iron salts in the water and the fact that the difficulty was caused by the manganese.

This experience led me to abandon the salicylic acid solution as a test for nitrates and turned my attention again to the phenol-sul-

phuric acid, with the hope of discovering some means for preventing off-colors, or at least correcting these when produced. The reagents were repeatedly tested, but it was impossible to attribute the discoloration to them; among the usual water constituents organic matters were most likely to cause the difficulty, and the attempt was made to purify the water by precipitation with alum before testing for nitrates, but this did not give the expected results.

The following process, however, has been successful as far as it has been tried, and depends upon the volatilization of the nitric acid when the water residue, in a duplicate test, is heated for some minutes with sulphuric acid on a water-bath, while the organic matter is acted upon by the sulphuric acid to produce the substances causing the off-color; in the test proper the nitric acid reacts to form a nitro-derivative, while the organic matter is acted upon as in the duplicate test; two solutions are therefore obtained, one representing only the color due to the organic matter, whilst the other contains additionally the color due to the nitro-derivative; by suitably diluting these solutions and adding to the former sufficient of the standard nitro-solution until the two solutions are matched, the quantity of nitrates can be determined.

The manipulation is as follows: Two portions of the sample of 10 c.c. each are evaporated to dryness in small porcelain capsules on the water-bath (mark the tests I and II); to I add 1 c.c. strong sulphuric acid; to II add 1 c.c. phenol-sulphonic acid; mix thoroughly with the water-residue and heat on the water-bath for five to ten minutes; then add to I 1 c.c. phenol-sulphonic acid, and to II 1 c.c. strong sulphuric acid; mix thoroughly and heat on the water-bath for five minutes; add to each 5 c.c. distilled water, then 10 c.c. water of ammonia (drop by drop), and, lastly, dilute with water to the same volume (the volume must be such that both of the resulting solutions will be much lighter in color than the standard solution, made as previously described; transfer the entire solutions or aliquot portions of each solution to cylinders or test tubes of equal inner diameter (to obtain equal columns of the liquids from the same quantities) and add to the lighter colored solution (I) measured quantities of the standard solution, to (II) add the same quantities of distilled water until the contents of the cylinders or test tubes match each other in color. Note the quantity of stand-

ard solution added and calculate to entire quantity of solution if an aliquot portion was taken; the number of cubic centimetres of standard solution (required for the 10 c.c. of water started with) $\times$ 0·14 will give the parts of nitrogen as nitrates per million parts of water.

AMMONIA DETERMINATIONS.

The importance attached particularly to the presence of albuminoid ammonia, exceedingly small quantities of which suffice to condemn a sample of water, and the difficulty of getting the reagents perfectly free from ammonia makes this the most difficult determination in a water analysis. For some years past the writer has carried out these determinations in a manner which insures the greatest possible accuracy with the least amount of extra manipulation.

The *alkaline potassium permanganate solution* is made by simply dissolving the chemicals in distilled water; it is useless to attempt freeing this solution from ammonia as it cannot be kept so.

In making an analysis, the retort and condenser are rinsed with water, and the retort charged with 30 c.c. of the alkaline permanganate solution, and 200 c.c. clear river or distilled water; to avoid dangerous bumping of the boiling liquid some copper turnings are placed in the retort. The distillate is collected in portions of 10 c.c., and these set aside in regular order, and distillation continued until about 60 c.c. are left in the retort. (The operation so far is for the purpose of freeing apparatus and reagents from ammonia, and enables one in most cases to secure sufficient ammonia-free water to make up the solutions for comparisons. The first six portions of the distillate will, as a rule, contain all of the ammonia; to each of these is added 0·4 c.c. Nessler's reagent; should the last one still indicate the presence of ammonia, more of the distillates in their regular order will have to be tested). 100 c.c. of the water to be tested are now added through the tubulure, and 100 c.c. distillate collected in portions of 10 c.c. and set aside in regular order; in nesslerizing these it must be remembered that if a precipitate is produced it will be impossible to make a colorimetric comparison; it is therefore a good plan to first nesslerize the fourth portion, then the third and second. Should any of these yield a very deep color it will enable one to dilute the first distillate with one or more of

the later distillates, thus avoiding a possible precipitate, and saving the analysis. Total ammonia may be determined in several successive samples of water if the quantity of alkaline permanganate is increased (10 c.c. additional for every sample of water); if 500 c.c. of any sample (as is generally recommended) are to be used for a single determination a corresponding quantity of permanganate must be used.

After determining the *total ammonia*, the retort is rinsed with several portions of water and again charged with 100 c.c. of the sample, to determine the *free ammonia;* instead of adding a solution of sodium carbonate, I have always fused a little of the dried salt on platinum foil, and put the foil, with the fused salt, into the retort. The distillate is collected in four or five portions of 10 c.c. each and nesslerized as previously stated. The difference between the two determinations gives the *albuminoid ammonia.*

In matching the colors produced in the distillates with the aid of a dilute ammonium chloride solution, it was noticed on several occasions that the color produced by the ammonium chloride solution was not as intense as experience led me to expect; on making a fresh solution, and testing this with the reagents used in the former test, a much more intense coloration was produced, showing that the *dilute ammonium chloride solution will not keep indefinitely*, but must be occasionally compared with or replaced by a fresh solution. One of these deteriorated ammonium chloride solutions gave a very satisfactory test for nitric acid, indicating the oxidation of the nitrogen originally present as ammonia.

The suggestion has been made in processes in which 500 c.c. water are used for the ammonia determination to match the color by using a piece of amber glass, the value of which has been ascertained; this I have not found satisfactory when only 100 c.c. of water are used.

A large number of experiments have been made to obtain a *permanent* solution with which the colors obtained in the nesslerized distillates can be imitated and the ammonia estimated; success in this will mean the saving of much time in the determinations, as, after a set of solutions, representing various quantities of ammonia, is once prepared, there will be no occasion for the preparation of ammonia-free water.

SOME SHORTER PROCESSES FOR THE PRODUCTION OF PHARMACOPŒIAL PREPARATIONS.

BY F. W. E. STEDEM.

The writer desires to call your attention this afternoon to some methods in use by authority of the Pharmacopœia which, in his judgment, could be modified to advantage. It is not his purpose to pose as the author of any of these modifications or changes. He wishes simply to add testimony as to their usefulness and emphasize the desirability of their adoption in future publications of the Pharmacopœia. A few samples are submitted as specimens of finished products made by the methods described. Most of the processes outlined have been in use by various pharmacists for years, and bear the stamp of approval of some of the best men of the land. We will first consider some of the tinctures of the Pharmacopœia.

Tincture Asafetida, as you are all aware, is directed to be made by maceration and then to filter, adding alcohol through the filter until the desired quantity is obtained. This preparation can be made by percolation. Select the asafetida and reduce to a coarse uniform powder. Introduce into a percolator prepared in the usual way, add alcohol in suitable quantity, macerate for forty-eight hours and proceed with the operation of percolation. The advantages are all those of concentration of effort, avoiding the necessity of filtration, reducing the uses of utensils and vessels to the minimum and obtaining a tincture of reliable and standard quality in at most three or four days.

Tincture Calumba.—Scarcely a month goes by without the appearance of an article in some one of the pharmaceutical journals relating to this tincture and the difficulty of preparation when the Pharmacopœial process is followed. The whole difficulty can be obviated by carefully preparing the powder No. 20 and proceeding with the percolation and observing the precaution of packing loosely, *not* moistening the drug, as directed by the Pharmacopœia.

Tincture Guaiac and *Ammoniated Tincture of Guaiac.*—These can be easily and quickly prepared by reducing a selected resin to fine powder in a mortar and adding the necessary menstruum gradually, triturating constantly. When most of the resinous matter is dissolved, transfer to a prepared filter and wash the residue and filter

with enough menstruum reserved from the original quantity to make up the measure. The whole operation need not take more than two or three hours, and the results are entirely satisfactory. This has been proven by comparative weighing of residue on preparation of the two tinctures by both processes.

Tincture of Iodine.—Reduce the iodine to a uniform coarse powder. Use a glass funnel and press a plug of absorbent cotton tightly into the neck; lay over this an evenly cut piece of white filter paper. Introduce the iodine into the funnel, and add alcohol carefully. Should all the required alcohol be added and the iodine not all dissolved, reintroduce the weak tincture and continue until the iodine is all dissolved. By careful preparation of the funnel, however, I have always succeeded in completing solution by first treatment. My attention was called to this method by our fellow-member Mr. John H. Hahn.

Tincture Myrrh.—By far the most important of any of the various resinous tinctures is that of Myrrh. The process of percolation is beautifully adapted to the making of this important tincture. Reliable and satisfactory results are always obtained, and the advantages are many, saving of time and cleanliness being not the least important. This process was taught me by my old friend and preceptor, Mr. E. M. Boring, he being the originator of it. I may here add that from this preparation and the successful conduct of it I got the idea of extending the method to all the resinous tinctures of the Pharmacopœia. Prepare a percolator in the usual way. Put in the myrrh (previously reduced carefully to a uniform coarse powder, say 16 to 18) *without* moistening, pack gently, and add menstruum until the liquid wets the cotton of the percolator; close the lower orifice of the percolator, and allow the mixture to stand twenty-four hours, then proceed slowly at first and more rapidly toward the end of the process. An examination of the gummy residue will convince anyone of the reliability of the method.

Camphor Water and *Aromatic Waters.*—Camphor water can always be had in quantity and without the least trouble if several fair-sized pieces of camphor are weighted with fragments of glass rod or selected clean stones and immersed in a suitable quantity of distilled water. After a few days' standing the water will be found to be saturated. The process is that of circulatory displacement; those particles of water next the camphor, becoming saturated,

ascend to the top of the vessel, and so on continuously. Each time camphor water is required and taken from the vessel an equal quantity of fresh distilled water should be added, as by that means the supply is inexhaustible.

PROXIMATE ANALYSIS OF BARK OF PINUS ECHINATA, MILLER.

By Chris. Koch, Jr.

In the American Journal of Pharmacy of January, 1896, the late Professors Bastin and Trimble called attention to the small amount of original research which had been made on the plants of the Coniferæ. Together they made a series of general researches—chemical and microscopical—of a number of the members of this order. They also suggested a line of further research.

Acting on these suggestions the writer was prompted to make a proximate analysis of the bark of *Pinus echinata*, Miller, or, as it is commonly called, yellow pine.

This tree is of vast commercial importance. The bark is used for tanning, while the younger trees also figure in the turpentine industry. Its lumber is the well known yellow pine used in all building operations. The lumber is also used for making masts and spars in shipbuilding. The wood is fine grained and, when devoid of the sap or outer portion, is remarkably durable. For a fuller description of this tree the reader can refer to American Journal of Pharmacy, 1896, page 199.

Proximate analysis of the Bark.—The bark used for the following analysis was a portion of the same lot investigated by the late Professor Trimble. It was collected at Hammonton, N. J., about December 1, 1895, and was the bark of quite a young tree. It was reduced to a very fine powder, and then treated as follows: A quantity of the bark was macerated with cold distilled water for a short time, and then filtered. The filtrate gave the following reactions: Lead acetate, flesh colored precipitate; ferric chloride, green coloration with green precipitate; gelatin, flesh-colored precipitate; bromine water, yellow precipitate. These reactions all indicated the presence of tannin. The residue on the filter was washed with water. It was then boiled with water and filtered. The cold filtrate was then tested for starch. No starch was found.

Moisture.—A weighed portion of the bark was dried in an air-bath at a temperature of 110° until the weight became constant. The loss in weight was figured as moisture, and amounted to 8·55 per cent. of the bark.

Ash.—This dried bark was then ignited to constant weight. The ash remaining amounted to 1·4 per cent. of the bark. Of this ash, 16·07 per cent. was soluble in water, 39·29 per cent. was soluble in hydrochloric acid and 44·64 per cent. consisted of siliceous matter. The part soluble in water was alkaline to litmus paper. It was tested qualitatively, and potassium, sodium and sulphates were found. The acid solution showed calcium in the form of phosphates. The ash also contained calcium carbonate. The insoluble portion gave the silica skeleton with the microcosmic salt bead.

Extraction.—A weighed portion of the bark was then treated with the various solvents according to Dragendorff's scheme. In each case the solvent was applied in successive portions until it had no further action upon the bark.

In the case of the petroleum ether, ether and absolute alcohol extractions, the successive portions of the same solvent were united and the solvent recovered by distillation. This left the extracted matter in a concentrated form. It was then dried to constant weight, in each case at 110°. After the bark had been exhausted with petroleum ether, it was carefully heated to drive off the last trace of the solvent. This operation was repeated after the ether extraction and again after the absolute alcohol extraction. Each of the three aqueous extractions was made up to a definite volume. In each case an aliquot part of the volume was evaporated to dryness on water-bath, in order to estimate the total solids. The residue so obtained was then ignited, which gave the amount of inorganic constituents. The difference gave the amount of organic solids.

All percentages given in the description of the extracts are based upon the air-dried powdered bark.

Petroleum Ether Extract.—This extract amounted to 1·66 per cent., was solid, of a dark brown color, and had a rosin-like odor. It was first treated with alcohol and filtered.

The filtrate was evaporated to constant weight on a water-bath; the resulting extract was of a dark brown color, had a rosin-like odor, was solid at room temperature, but liquid at temperature of the water-bath. It amounted to 1·09 per cent. of the bark. It was

entirely soluble in ether, chloroform and acetone. Its alcoholic solution gave a precipitate with alcoholic lead acetate, but alcoholic ferric chloride did not affect it. An alcoholic solution of potassium hydrate did not saponify it. The behavior of this substance indicated it to be a resin or resinous matter.

The part insoluble in alcohol was collected on a filter, and air-dried. It comprised 0·57 per cent. of the bark.

It was entirely soluble in ether, chloroform, acetone and carbon sulphide. Its melting-point was taken and found to be 58°. It was slightly saponified by aqueous potassium hydrate, but alcoholic potassium hydrate saponified it entirely. The fatty acids were separated from the saponified matter collected, and their melting-point taken. It was found to be 92°. The behavior of this saponified substance indicated it to be a wax. The odor observed in analyzing the petroleum ether extract was due to a trace of volatile oil.

Ether Extract.—This extract was of a very dark brown (almost black) color, solid at the room temperature but liquid at the temperature of water-bath, and comprised 3·09 per cent. of the bark. It was first treated with hot water. The solids of this aqueous solution comprised 0·84 per cent. of the bark. It was examined qualitatively with the following results: Ferric chloride, green color and precipitate; lead acetate, flesh color precipitate; bromine water, yellow precipitate. These tests indicated tannin.

It also showed traces of reducing and invertible sugar. A portion of this aqueous solution was shaken out with ether in a separatory funnel. The ethereal layer was evaporated and the residue dissolved in water. Neither ferric chloride nor lead acetate gave any reaction with this solution indicating the absence of protocatechuic acid.

The part of this extract which was insoluble in water was entirely soluble in chloroform and acetone, but only partially soluble in ether. The part which was insoluble in ether was soluble in potassium hydrate, but was not precipitated upon the addition of acetic acid, showing absence of phlobaphenes. It was probably some altered resinous matter.

The extract was then treated with hot alcohol which dissolved all but a trace of altered phlobaphene. Upon cooling this filtrate, some of the dissolved portion was redeposited. This deposited material was treated with potassium hydrate which almost entirely

dissolved it. Upon the addition of acetic acid it was precipitated. Ammonium hydrate dissolved this precipitate. It was again precipitated with acetic acid. This precipitate reduced nitric acid. It was found to be phlobaphenes.

The portion of the redeposited material above spoken of, which was insoluble in potassium hydrate was of a pale yellow color and rather flocculent character. It was tested for nitrogen by Lassaigne's method. No nitrogen was found, indicating the absence of albuminous matter.

A portion of the clear alcoholic solution was evaporated to dryness and the residue treated with nitric acid which was reduced. Alcoholic ferric chloride gave a green color, and lead acetate a brown precipitate, all of which indicate phlobaphenes.

Absolute Alcohol Extract.—This extract was of a chocolate color, had a nauseous odor, and was of a porous character. It comprised 9·03 per cent. of the bark. It was first treated with water and filtered.

The soluble matter of this filtrate comprised 3·16 per cent. of the bark. It was made up to a definite volume and examined as follows:

An aliquot portion was completely precipitated with basic lead acetate and filtered. The lead contained in the filtrate was then precipitated with hydrogen sulphide and filtered. The resulting filtrate was then heated on water-bath until the vapor emanating therefrom no longer acted on lead acetate paper. It was again filtered and divided into two equal portions. The first portion was made alkaline and treated with Fehling's solution. The resulting precipitate of cuprous oxide showed the presence of glucose. This precipitate was collected on a filter and washed. It was then ignited and weighed. The percentage of glucose was then calculated and found to be 0·75 per cent. of the bark.

The second portion of this prepared solution was boiled with a few drops of sulphuric acid. It was then made alkaline and treated with Fehling's solution. The resulting precipitate of cuprous oxide was collected, washed and ignited to constant weight. This precipitate was heavier than the precipitate obtained from first portion. This increase in weight was due to inverted sugar. Upon calculating the percentage, it was found to be 0·13 per cent. of the bark.

In another aliquot portion, the tannin was estimated according to the gelatin and alum method. It comprised 0·17 per cent. of the bark.

Another aliquot portion was shaken out with ether in a separatory funnel. The ethereal layer was evaporated and the residue taken up in water and the following tests applied:

Lead acetate	Slight lemon-yellow precipitate.
Gelatin	Slight coloration.
Lime water	Reddish-brown precipitate.
Bromine water	Yellow precipitate.
Ferrous sulphate crystal	No change.
Ferric chloride	Slight green color.

Sodium carbonate did not develop a red color. These tests proved the absence of proto-catechuic acid. The reactions obtained were due to tannin.

The remainder of this solution was shaken out with ether, petroleum ether and chloroform in a separatory funnel. These solvents were applied one at a time, and in each case the solvent was drawn off before the next was put on. The various solutions were evaporated and their residues taken up in water. This solution was tested for glucosides, but none was found. After the above solution had been shaken out with ether, petroleum ether and chloroform, it was made alkaline and again shaken out with ether. The ethereal layer was evaporated and the residue taken up in acidulated water. This solution was then tested for alkaloids with Mayer's reagent, phospho-tungstic acid, gallotannic acid, picric acid, platinic chloride, gold chloride and potassium tri-iodide, none of which revealed the presence of alkaloids.

The part of the extract insoluble in water amounted to 5·87 per cent. of the bark. It was entirely soluble in dilute ammonia water. This solution was precipitated with acetic acid and the resulting precipitate was tested with nitric acid and alkalies. It proved to be phlobaphenes.

Water Extract.—Water extracted 2·18 per cent. of organic solids from the bark.

An aliquot part of the volume was mixed with five times its volume of alcohol and allowed to stand. The resulting precipitate was collected on balanced filter and dried at 110°. It was tested for nitrogen by Lassaigne's method, but none was found, proving it to be a mucilaginous substance. It comprised 0·42 per cent. of the bark.

The alcoholic filtrate was evaporated almost to dryness and again treated with alcohol. The resulting precipitate was collected, dried and weighed. Tested for nitrogen, but found none, which indicated it to be dextrine. It comprised 0·52 per cent. of the bark.

Another aliquot part of this aqueous extract was precipitated with basic lead acetate, filtered and the filtrate precipitated with hydrogen sulphide, again filtered and hydrogen sulphide removed by evaporation. The resulting liquid was then tested for reducing and invertible sugar; it showed only a trace of reducing sugar.

Alkaline Water Extract.—Weak NaOH solution extracted 5·73 per cent. of organic solids from the bark.

An aliquot portion of this alkaline water extract was acidified with acetic acid precipitated with alcohol. The precipitate was washed, collected and dried to constant weight. Lassaigne's test for nitrogen was applied but no nitrogen was found, proving it to be a mucilaginous or gummy substance. It comprised 2·20 per cent. of the bark.

Acidulated Water Extract.—Weak HCl solution extracted 3·51 per cent. of organic solids from the bark.

An aliquot portion of this extract was made alkaline and precipitated with alcohol. The precipitate was washed, collected and dried to constant weight. Did not find any nitrogen, proving it to be pararabin. It comprised 0·70 per cent. of the bark.

The bark having now been subjected to all the solvents, a portion of it was washed with water and tested for starch, which was found absent.

Lignin.—The exhausted bark was now treated with chlorine gas which destroyed 3·72 per cent. of its air-dried weight. The lignin destroyed by potassium chlorate and nitric acid amounted to 52·17 per cent. of the original air-dried bark.

Cellulose.—This was determined by igniting the residue remaining after the destruction of the lignin, and subtracting the ash from this residue. It amounted to 6·14 per cent. of the bark.

Volatile Oil.—125 grammes of the bark were distilled in a current of steam, to examine the bark for volatile oil observed in the petroleum ether extract. The amount of volatile oil, however, was so minute that it did not separate at any time from the aqueous distillate. The distillate had an aromatic, rosin-like odor.

Tannin.—For the purpose of estimating the tanning value of the

bark, the hide powder method was followed. This process showed 10·24 per cent. of tanning material.

The small amount of soluble tannin met with in the course of the above analysis indicates the readiness with which the tannin of this bark changes into phlobaphenes.

An attempt was made to extract and purify the tannin, but this proneness to decomposition again asserted itself.

125 grammes of the bark were exhausted with acetone, and the solvent recovered by distillation on the water-bath; the extracted matter was then treated with water, and the mixture filtered to remove insoluble substances. The clear filtrate was agitated with acetic ether, and subsequently saturated with sodium chloride.

Upon separation of the acetic ether layer and recovery of solvent, very little residue was obtained. Upon treatment with water this was changed almost entirely into phlobaphenes.

A small sample of the extracted tannin of *Pinus echinata* was obtained from the collection of tannins owned by the late Professor Trimble.

It was of a reddish-brown color, had a bitter astringent taste and was sparingly soluble in water. Its aqueous solution gave the following reactions:

Lead acetate	Flesh colored precipitate.
Bromine water	Yellow precipitate.
Lime water	Brown precipitate.
Ferric chloride	Green color and precipitate.

The material was treated with several successive portions of ether to remove any soluble matter and afterwards thoroughly dried at 110°.

The dried material was submitted to ultimate analysis with the following percentage results:

	I.	II.
Carbon	58·36	58·74
Hydrogen	4·93	4·78
Oxygen	36·71	36·48

The results of the combustion as well as the qualitative tests, show this tannin to belong to the oak bark tannin group and not to the gall tannin group.*

* See Trimble's "The Tannins," Vol. II, p. 132.

IMMUNITY TO POISONS.

BY WILLIAM B. THOMPSON.

The remarks of the editor of this JOURNAL on the apparent immunity of fowls from the toxic action of drugs prompts the following thoughts:

The immunity of certain animals to the action of poisons and of poisonous drugs, finds an analogy to some extent in the resistance which the insect tribe appear to have against the acrid, irritant and destructive character of many substances. Take the well-known ravages, in depredation, upon cantharides, capsicum, *et al.* The impunity shown is a marvel to the understanding. These animate creatures, large and small, obey, of course, one common implanted instinct, namely, the quest for food. Although they may not always be revelling in the choice of their pabulum, they have a faculty of adapting circumstances to their wants and of securing a supply from one source or another. It is a puzzle to our minds that *they* continue to exist and flourish when our more acute senses revolt and our sense of danger cautions. The benign Creator has withheld from these creatures a keen sense of discrimination between the hurtful and the harmless, and, therefore, as a compensation, perhaps, he may have constituted the lower orders less vulnerable to the action of poisons.

Animals, generally, are not endowed with a premonitory sense of danger, therefore they do not have this safeguard so inestimable to *our* lives. The lamb follows the executioner to the slaughter, unconscious of impending death, although the fatal axe may be swinging in full view of the beast.

The immunity of fowls (if credibly ascertained) against the toxic action of nux vomica, is not readily explained, because their processes and function of digestion and assimilation *are* quite similar to ours, —consider the rigid, muscular strength of the gizzard. It would, therefore, seem that there is the same general provision in this case for the decomposition of food as exists in the carnivora, or as in man, with his varied and miscellaneous diet. Digestion and excretion are far more rapid in the lower than in the higher class of animals, notably in birds. The separation of that which is required from that which is valueless is a rapidly performed process In the former, and we assume that the fact is established that the carnivora are much more susceptible to the action of poisons than

the herbivora. In fact, the whole subject of animal chemistry invites close thought and study—its operations being by no means, as yet, fully comprehended.

With regard to the utility of spent drugs as a basis of poultry or other food, experimentally, would require caution. Starch, gum. wood-fibre are undoubtedly left as residuum, and any adaptation might rest upon the fact that in the instinct for food, nature seems inclined to demand bulk. In this bulk there is always, as we know, a very large proportion which is useless or valueless. But nature, as we term the vital processes, seems to prefer to make her own selection, and there must be enough bulk of substance for the muscular grasp to take hold of. In all the economies of practice, the utilization of waste constitutes wealth—this is a highly important consideration in every department of industry.

A NOTE ON CARDAMOMS.

By Frederick L. Lewton.

A paper by Daniel Hanbury on "Some Rare Kinds of Cardamoms," appearing in the *Pharmaceutical Journal* of February 1, 1855, contained careful minute descriptions of the cardamoms of Siam, Cochin China, Tonquin and China, illustrated by excellent wood-cuts; references to other published descriptions, and notes upon the properties, uses and commerce of the several varieties.

The natural order to which the cardamom belongs was a particular favorite of this great man.

Joseph Ince, in his memoir of Daniel Hanbury, says: "He worked on the Zingiberaceæ as though he loved them; amusing were his private comments on those who without much real learning had ventured on the intricacies of the theme, and had longer life been granted, Hanbury would have amplified and extended to the utmost a line of investigation which possessed for him a peculiar charm."

In addition to the numerous samples of cardamoms procured directly from authentic sources, Hanbury studied the specimens of Loureiro, Pareira and other investigators, which had been deposited in several European museums. In the article mentioned above he frequently states, after giving a minute description of some rare variety, that the specimen in question may be found in the Museum of Natural History at Paris, or the British Museum, or some other such institution.

In 1873, eighteen years after the publication of Hanbury's paper, among the thousands of objects exhibited at the Vienna Exposition, there were exhibited samples of cardamoms from Siam and China, agreeing perfectly with the descriptions of the rare kinds in Hanbury's paper. These samples are in the Philadelphia Museums, and when supplemented by a series of specimens collected some fifteen years ago in the bazaars of India, and others showing the commercial varieties of to-day, they make the most interesting collection of cardamoms ever gotten together.

Many of the specimens comprising this collection were received, labelled simply "Cardamoms," and their identification at the Philadelphia Museums with Hanbury's excellent descriptions, published nearly fifty years ago, have proved a most interesting study.

A case of cardamoms exhibited by the Siamese Government at the World's Fair in 1893, was labelled "Wild or Bastard Cardamoms." It was found upon examination to contain a mixture of fully ten distinct varieties, some belonging in the genus *Amomum*, and others to the nearly related genus, *Alpinia*.

Pharmacists and all engaged in the handling of cardamoms will do well to examine the collection in the Philadelphia Museums, as a number of these varieties have little or no aromatic properties and the same might be foisted upon them instead of the official drug.

LOCALIZATION OF ALKALOIDS.—Nicotin is contained, according to Wijsman-Leyden (*Sudd. Apoth. Zeit.*, 1898, 636), as a rule, in the cells underneath the hairs. It is also found in the cells of the upper epidermis. The question is, therefore, an open one as to whether it is contained in the protoplasm or in the vacuoles. If one removes a piece of the upper epidermis of a tobacco leaf and places it in an iodine solution the nicotin reaction occurs immediately, in the form of a brown coarse-grained precipitate, at the basal end of the under cell. The precipitate then extends along the side walls. The reason for this slow action along the side walls of the cells of the hair lies in the fact that the latter like the outer walls of the upper epidermal cells are cutinized so that the iodine solution enters slowly. It appears as if the nicotin is dissolved in the cell sap (vacuoles).

If cells containing berberin are plasmolyzed with concentrated nitric acid, the contents at the point where they are concentrated are colored darker. After awhile the vacuole wall disappears and the nitric acid penetrates into the vacuole. Then there appears a granular precipitate of berberin nitrate, which soon begins to crystallize. The vacuole is filled with groups of crystals of berberine nitrate, which, by and by, occupy the whole space, and after the vacuole collapses remain as sphere crystals.

THE STUDY OF STARCH GRAINS AND ITS APPLICATION.[1]

By Henry Kraemer.

The object of bringing this paper to the attention of the National Pure Food and Drug Congress is two-fold. While it has primarily to do with some studies that were made preliminary to an examination, which was requested of the writer several years ago, by Prof. J. U. Lloyd, on the subject of flour and its adulterations, it is given at this time to indicate the necessity of the co-operation of the specialist in biological work with the chemist in determining the standards of purity of drugs and foods.

The compounds that man extracts from the plant, or which make a plant useful to him as food, are likewise food compounds for the use of the plant. These food elements are only to be found as products of constructive metabolism and are sooner or later used by the plant in building up new cells, etc. These highly elaborated and complex food products are invariably, at one time or other, stored by the plant in some one of its members. Naturally enough, the place of storage is dependent upon the surroundings of the plant. In the plants of the hot and burning deserts they are stored either in roots (as asafœtida), or stems (as cacti), or leaves (as in the century plant). In the plants of the temperate regions the rhizome or leaf scales or leaf buds contain this nutriment. It may be further said that all plants provide their offspring—whether seeds or spores—with enough nutriment to sustain them until they can provide for themselves. In some cases food is also contained in special parts to assist fertilization in the flowers and dissemination of the seed.

Almost all of the food materials which man obtains from the plant kingdom are obtained from these reserve supplies. They may be found in tuberous roots (as sweet potato), tubers (white potato), leaf scales (as onion), bud scales (as asparagus), fruits (as tomatoes, bananas), or seeds (as peas, corn, wheat, etc.). It may also be said that whenever these food supplies are contained in the plant they are frequently naturally protected (as shown by the investigations of Stahl) by means of principles that are poisonous to the animal world. In some cases by the process of cultivation and selection, these principles may be increased or diminished according to the treatment.

[1] Address to the Pure Food and Drug Congress, Washington, D. C., January, 1899.

For instance, in white potato the alkaloid solanine is decreased whereas in cinchona and opium the alkaloids are increased by process of cultivation.

ORIGIN AND FORMATION OF STARCH.

We now come to consider the first visible product of constructive metabolism of the plant, viz.: starch. It occurs in the plant as an assimilative product and as a reserve product. In the former condition it is found in all the green parts of plants at the close of day in the summer when the sun has been shining upon them. As a reserve product it is found in roots, rhizomes, barks, buds, fruits and seeds.

The assimilative starch is synthetically produced from the inorganic compounds, carbon dioxide and water, and results only when the chloroplastid is present and the plant is supplied with light and salts of potassium. It has been supposed that the reaction may be represented as follows: That 5 molecules of water and 6 of carbon dioxide produce 1 molecule of starch with the liberation of 6 molecules of oxygen.

There is no doubt that there are simpler products first formed, and it is supposed, from the experiments of Bokorny, that formaldehyde is one of the primary compounds. This experimenter removed all starch from specimens of Spirogyra, and then fed them in the dark with a sodium salt of formic aldehyde. Starch was rapidly formed in the chloroplastids, thus indicating the possibility that other compounds are formed before we have the product finally formed which we recognize as starch.

It has not been possible as yet to demonstrate the successive steps in the process of development of starch. All that we can say is that the production of starch normally is dependent upon the following conditions, viz.: light; air containing CO_2 and moisture; and that the organ in which it is produced is the chloroplastid, when associated with protoplasm. The chloroplastid consists of a ground substance, and a pigment which again is made up of a green (chlorophyll), a yellow (xanthophyll), and also a reddish fluorescent principle. Very many experiments have, however, been made to determine what part the chloroplastid and protoplasm play in the production of starch, and necessarily numerous theories have been proposed. One view was (that by Sachsse) that the chlorophyll

itself is changed into starch. Another view is that the protoplasm is changed into starch. In opposition to these chemical theories we find also physical theories. These are based upon the difference in the character and action of the rays of the sun, which are absorbed by the chlorophyll, and those that pass through it. These results have been obtained by the examination of solutions of chlorophyll by means of the spectroscope. One view, which is supported by Lommel and Müller, and apparently confirmed by the observations of other investigators, is that the rays—more especially the blue and red—which are absorbed by the chlorophyll are changed into some other form of energy, which is able to make starch synthetically out of carbon dioxide and water. Pringsheim, on the other hand, considers that the chlorophyll acts as a filter of the rays of light, and that those absorbed are not active in the work of assimilation, but on the contrary interfere with the process, so that those that pass through are the rays which effect the production of starch. It is also held that just as there is a combination in the blood between hæmoglobin and oxygen, so the chlorophyll combines and fixes carbon dioxide. It is difficult to decide just what is the process in the manufacture of starch by the plant, and it is not unlikely that the rays absorbed by the chlorophyll are those directly concerned in the process, as a number of investigators have found that the production of starch is much more energetic in green plants when exposed to those colors which are absorbed by the chlorophyll solution to the greatest extent. And yet who can say that the secret of life does not lie here in the chloroplastid, that it is not only the mill which supplies the world with its food, but it is also the organ which changes the energy of the sun into vital energy. It may be that the sun is the source of the energy, the carbon dioxide and water the materials, and the chloroplastid the laboratory whereby vital energy is created and bound and held in the substance which we call starch. If we stop a moment to consider this we will find that the animal creation is wholly dependent for its energy upon the starch grain produced in the plant. If the plant (as clover), or seed, or fruit (as oats, etc.), is consumed by horses, the energy of the starch grain is changed to horse-power. If the plant is consumed by cows it becomes milk and meat, and may in turn furnish us energy. From these products of the animal creation as well as from the plants directly, we obtain our power to live and act, *i. e.*, the energy we possess

comes to us and every animal from a kind of potential (probably vital) energy stored in the plant, which the latter has received from the kinetic energy of the sun. The value of one food over another lies in the amount of stored energy that it contains, and which is ordinarily calculated as fuel value. From the consideration of the plant along these lines, some have defined the plant as a machine for storing energy.

KINDS OF STARCH.

It was stated that if we examine the chloroplastid at the close of a day in summer, when the sun has been shining brightly upon the plant, we would observe, by proper manipulation, minute starch grains, called *assimilation starch*, in each chloroplastid. If the latter is examined in the early morning, it will be found to be comparatively free from starch; and the question arises, what has become of it? We find that during the night it has been changed into soluble carbohydrates by the aid of ferments and other substances, and, as such, transported to the portions of the plant that require food. If this process takes place during activity of growth in the plant, it is transmitted to the growing point of root, stem or leaf, etc., and is utilized in the building-up of new cells, etc. In many of the cells through which the solution of carbohydrates passes *en route* to the growing point, or even at the growing point, it may be transformed back to starch by a colorless chloroplastid, called leucoplastid. Starch that is produced in this manner, and being in a transition or resting stage, awaiting further orders or calls, so to speak, before going further, is spoken of as *transitory starch*. The starch in the medullary rays, as well as in other cells of the wood and bark of plants, is of this character, and distinguished by being in the form of rather small and nearly spherical grains.

After the production of the elements (as roots, branches with leaves, flowers, etc.) required for one year's growth, most plants, as a rule, provide food for their next year's growth, if they survive, or for that of their offspring. The character of the provisions laid by depends upon the nature of the plant and the conditions under which it develops. While starch is commonly the principle stored for this purpose, in some cases other substances represent the reserve product, as cellulose (in nux vomica), oil and proteids (in mustard), etc. Oil replaces starch in seeds which are to be transported to

some extent by the agency of the wind; whereas it is replaced by cellulose in seeds where germination is a long time in being effected. Starch, however, is the substance most generally stored by the plant, and this is found in connection with other principles, as oil (in corn) and proteids (in wheat), etc. The starch which we find in rhizomes, tubers, bulbs and seeds owes its origin, like the transitory starch, to the leucoplastids which change the sugar solutions which they receive through the moving protoplasm back to a more stable form, viz., the starch grain. It is then called "*depot*," "*storehouse*," or, more frequently, "*reserve*" *starch*. The starch grains of this class differ from either "transitory" or "assimilation" starch in that they are, as a rule, quite large and the grains are more characteristic for the different plants in which they are produced; this is especially marked in the starch we find in rhizomes, tubers and other metamorphosed stems.

ORIGIN OF GROWTH OF GRAIN.

This brings us, then, to the consideration of the starch grain itself. In some cases we observe a distinct centric or eccentric marking, around which lamellæ or layers may extend. The centric or eccentric marking is spoken of as the "hilum" or "nucleus" of the grain. The terms "hilum" and "nucleus" are, however, open to criticism, inasmuch as they are employed in botanical language for another specific purpose. The expression "point of origin of growth" would be better on account of its being less confusing, and is, moreover, descriptive and accurate. The "point of origin of growth," is the part of the starch grain that was first formed by the plastid and according as new products were added we have a nearly spherical or elliptical or irregular shaped grain.

The point of origin of growth in some starch grains is only discerned by the use of reagents or polarized light. When it is distinct it may be described as being either a nearly spherical mark, or a distinct fissure. In some cases there are several fissures which cross one another. All of these marks are to be employed practically in distinguishing those starch grains in which it is possible to discern the botanical source.

CONSTITUTION OF STARCH GRAINS.

We have observed in some grains, as the result of additions or growth, that there are layers or lamellæ. What does this mean?

Does it indicate resting periods in the growth of the grain, and that as each layer is added there is a strong demarcation—or does it mean that we have layers differing in composition, etc.? This brings us to consider the composition of the starch grain and the meaning of the different layers. If we consult any of the standard works on organic chemistry, we find the formula for starch given as $C_6H_{10}O_5$. This formula gives us simply the proportion of the elements carbon, hydrogen and oxygen, without any scientific or practical information in regard to either its physical or exact chemical composition. On the other hand, the starch grain has been the subject of much interesting investigation by botanists. In fact, what is to be considered one of the greatest intellectual feats of the century was the study of the starch grain by C. Nägeli. Previous to this time several hypotheses had been given as to the origin of starch grain: (1) It was considered to be a bubble filled with a liquid (" Flussigkeit gefullten Blase "). (2) Then it was considered (1834) that from a centric or eccentric point, layer after layer was added. (3) Payen (1838) conceived the idea that growth took place from the outside towards the centre. (4) By others (1845) it was considered that growth of the starch grain was like that of the cell wall. Nägeli, in 1858, announced that growth of the starch grain was effected by the interpolation of new material among the particles already formed. He advanced the idea that the starch grain consisted of elementary particles or molecules which were made up of atoms (Stärkeatome or starch atoms) consisting of C, H and O.

Later, inasmuch as the term molecule was being employed by chemists to mean something different from what he had in mind, he invented the term *micellæ*, meaning thereby that each micella consisted of larger or smaller numbers of chemical molecules. These micellæ were described by him from the interference of colors observed with the polariscope as being " biaxial crystals and he assigned to them as a probable form, that of parallelopipedal prisms with rectangular or rhomboid bases." He said each micella has a watery film (Wasserhulle) and is surrounded by a mother liquor which is different in composition from the micellæ. The latter, with their watery films, are " held together by the following forces: (1) The attraction of the micellæ for each other, a force which varies inversely as the square of the distance between them; (2) the attraction of each micella for the water which surrounds it, a force which

varies inversely as some higher power of the distance; and (3) the force which holds together the ultimate chemical molecules of which each micella consists."

The development of the reserve starch grain does not consist simply in taking up sugar (Glycose), but consists in its transformation into starch. To this end the micellæ do not alone suffice, as the starch grains cease to grow when removed from the plant-cell, and are put into a sugar solution. The property (molecular kräfte) of living protoplasm must in some way contribute to bringing about this change by polymerization of the sugar-holding solution, between the micellæ, into starch substance. The new starch substance which is formed is utilized in part in increasing the size of the micellæ already formed, and also to form new micellæ, which develop and arrange themselves according to the laws that the micellæ already formed have obeyed. In this manner we have growth of the starch grain by means of the interpolation of new material between that which has already been formed, and this has given this theory the name "Intersusception Theory," to distinguish it from that in which new layers are supposed to be added upon those previously existing.

C. Nägeli has further shown that the starch grain consists of two different substances—one which is soluble in ferments, and called by him granulose, and the other which is insoluble in saliva, and called by him starch cellulose. He showed that the layering in starch grains was due to a difference in the amount of water in the different layers. This has given rise to the formula suggested by W. Nägeli for the starch grain which is 6 $C_6H_{10}O_5 + H_2O$, or $C_{36}H_{62}O_{31}$. Krabbe, on the other hand, claims the layering to be due simply to lines of contact between the separate lamellæ. In 1883 Schimper showed that all starch grains developed within plastids, and that, in the reserve starch grains, the leucoplastids finally disappeared. C. Nägeli was not cognizant of the presence of leucoplastids, these having been discovered after his early investigations, and he believed that while some starch grains arose in plastids the most of them arose free in the cell sap. Schimper's studies further showed that the outer portion of the grain was the youngest, and he also expressed the idea that starch grains were made up of sphere crystals of crystalloides, and called them "Spharokrystalloide."

In 1895 Arthur Meyer published a work on the starch grain, in

which he considers it to be made up of (1) α-amylose; (2) β-amylose, and (3) amylodextrin, a decomposition product of amylose. He also believes that inasmuch as there is an anhydride of dextrose which does not readily take up water there is probably also an anhydride of amylose which even on boiling with water is hydrated with difficulty, and this is the substance that has given rise to the hypothesis that there is present a starch cellulose. This latter term has been used for a number of different substances: (1) Mixtures of amylodextrin and α-amylose; (2) solutions of α-amylose and β-amylose; (3) solutions of β-amylose with various substances as nitrogen-holding substances, impure fatty products, pure amylodextrin, and the walls of plant cells which are contained in commercial starches unless carefully purified. He obtained the α-amylose upon treating starch paste (Stärkekleister) with malt solutions (Malzauszug) and by the action of hot dilute solutions of hydrochloric acid upon the whole starch grain. The portion (β-amylose) remaining is distinguished from the portion dissolved, in that it is not soluble in water and becomes slightly reddish in color, and not blue with iodine solutions.

He considers the starch grain to be made up of two kinds of acicular crystals (which he calls "Trichiten"), viz.: α-amylose and β-amylose, and that in certain starch grains which are colored red with iodine and not blue, there is also present amylodextrin and dextrin. He further says that most starch grains consist altogether or nearly so, of amylose, and that such are colored pure blue with iodine. These latter starch grains are made up of sphere-crystals of amylose, arranged in layers, and these layers may consist of crystals of either α-amylose or β-amylose, or both, and that some starch grains contain in addition large amounts of amylodextrin and dextrin, as in *Iris germanica*, *Gentiana lutea*, *Oryza sativa*, some orchids, grasses, etc.

MICRO-PHYSICAL EXAMINATION OF STARCH GRAINS.

Starch grains generally occur in isolated grains. Not infrequently, however, they are found in groups of 2 to 4 grains, when they are distinguished as 2-, 3- or 4-compound. In rice they are from 4- to 100-, in oats as many as 300, and in spinach as numerous as 30,000-compound. The individuals of compound grains are in some cases easily separated from each other. This separation of the grains

occurs frequently in the mounting of the specimen, and is especially noticeable as a result of the processes to which the plant has been subjected in the manufacture of food and medicine. The single grains thus separated are more or less angular. It sometimes occurs that a single starch grain possesses apparently 2 points of origin of growth, when it is spoken of as being half-compound.

While there is considerable variation in the shape of the grains isolated from different species of plants, there is also a greater variation in the grains from different, or even the same, plants of the same species. This variation more frequently occurs than is generally supposed, so that the greatest care must be exercised in utilizing the shape alone in determining the botanical source of the grains present in the specimen under examination. There is also considerable variation in the size of the grains not only from the same plant but even in the same cell.

Some foods and drug products are variously treated in preparing them for the market, and there is necessarily more or less of an alteration of the typical starch grains. For instance, they may be treated over the naked fire as jalap root, or moistened and dried either by exposure to the sun or near a fire as in guarana, or in hot water as aconite tubers. In such cases the starch grains are changed to swollen masses or are more or less corroded.

One of the most striking properties of starch grains is that when viewed by polarized light they show a neutral cross which extends from the point of origin of growth to the periphery of the grain. This neutral cross appears to turn as Nichol's prism is revolved and to produce the various colors of the rainbow. We likewise find that starch grains from different sources do not behave alike towards polarized light. The distinctness of the cross as well as the kind of colors produced, as Nichol's prism is revolved, varies considerably, and we are inclined to the opinion that this subject is well worth careful study from a practical, as well as scientific, standpoint.

MICRO-CHEMICAL EXAMINATION OF STARCH.

It has already been shown that most starch grains give a blue color when treated with iodine solutions, but that some are turned red by the employment of this reagent. It is supposed by some investigators that there is an actual chemical combination which

takes place between the iodine and starch. Meyer, on the other hand, does not consider the so-called iodide of starch to be either a chemical combination or a mechanical mixture, but says that it is "ein wohl definirte blaue Lösung von Iod in Stärke."

It ought to be borne well in mind that between the pure blue and red reaction of starches, intermediate colors may be produced, depending on the varying amounts of dextrin present.

Another important fact that may be mentioned in this connection is that if the aqueous solutions of iodine contain hydriodic acid, or if alcoholic solutions contain ethyl iodide, there is produced according to the amount of these foreign substances, as well as the character of the starch, colors which vary from yellowish or reddish-yellow to reddish or reddish-blue or even purple.

The starch in plant cells which is still surrounded by the plastids or imbedded in other materials, as resin, may be determined by means of a chloral-iodine solution, which clears the other substances and causes a swelling of the grains which are at the same time colored blue. It is useful in certain cases when much resin is present to dissolve out the starch by heating the sections in glycerin, and on the addition of excess of water the starch will separate from the solution in the form of minute grains.

A still more characteristic property of starch grains is that when they are heated in contact with water to 45–77° C., they swell and form a pasty mass. The temperature at which the different starches begin to form a paste is likewise deserving of practical consideration.

Not only do starch grains swell when heated with water, but they swell upon treatment with various reagents, as chloral, potassium hydrate, chlor-zinc-iodide, chloral-iodine, etc.

Various investigators since the time of Nägeli, who appears first to have experimented with the action of saliva on the starch grain, have used this and other ferments, as well as other substances, as reagents in the examination of starch. All of this work has been done by botanists, and has been for the purpose of ascertaining the composition and structure of the starch grain. There is, however, a very practical application to be made of the character of the interaction between reagents and starch grains; considering in this connection the amount of time and temperature required to complete the reaction; and the strength of reagent, etc. The writer has made

some experiments in connection with Florence Yaple on commercial starches, as well as the starches in the cells of the tuber of potato and fruits of wheat and corn, with the following reagents:

(1) Chloral iodine + iodine solution; of each 5 parts.
(2) Chlor-zinc-iodide solution.
(3) Chromic acid solution (15 per cent.).
(4) Calcium nitrate solution (30 per cent.).
(5) Chloral solution (saturated), water and glycerin; of each 3·3 parts. To this solution as much iodine is added as the solution will take up.
(6) Saliva.
(7) Silver nitrate (2 per cent.).
(8) Sulphuric acid (C. P. acid 90 parts and water 10 parts).
(9) Taka diastase (saturated solution).
(10) Sodium acetate solution (50 per cent.).
(11) Potassium hydrate solution ($\frac{1}{10}$ of 1 per cent.).
(12) Potassium nitrate solution (saturated).
(13) Tannin solution.
(14) Potassium phosphate solution (saturated).
(15) Hydrochloric acid (5 per cent.).

The numerous drawings which we present, indicate that there are characteristic results obtained by the use of these reagents. I will not take the time, however, to consider the details of the aforesaid experiments, as they will be incorporated in a subsequent paper to be presented before the Cincinnati Section of the American Chemical Society.

An examination of the commercial starches shows that there are certain amounts of impurities associated with them which may further serve as a means of identification. Meyer has shown that potato starch contains from 0·27 to 0·62 per cent. of mineral substance; the amount of water is generally about 20 per cent.; and that it generally contains about 0·322 per cent. of nitrogen; there is also present a body which is soluble in ether and which gives a bad odor on heating a solution with hydrochloric acid. The starch may be purified by washing with water containing ammonia which does not alter the starch grain as potassium hydrate does.

Wheat starch of commerce reacts acid and contains lactic acid, acetic acid and protein matters. Rice starch gives an alkaline reaction.

APPLICATION OF THIS KNOWLEDGE.

From what has been said it is apparent that we are for the most part indebted to botanists and pharmacognocists for the advancements made in our knowledge of the constitution and composition of starch grains. This follows as a natural sequence of their studies in the plant kingdom. It may be noted that there are many facts at the command of the student of botany which may be turned to practical account in the study of this and similar subjects. It has been shown in this article that micro-physical and micro-chemical examinations reveal an abundance of information which might be turned to practical account in the study of plant products containing starch. I am aware that this Congress has met to secure the desired legislation on pure foods and drugs and prevent undesirable amendments, but it is extremely important that it shall also consider what departments of science shall furnish the judges who shall determine what the standards of purity shall be. It is exceedingly important, and, indeed, absolutely necessary that every precaution should be taken to insure the public who use the foods and drugs, as well as the business man who manufactures and supplies these products, that there is a standard that can be determined and that is just and fair. It is very manifest, from the complications which have arisen by reason of food and drug legislation thus far enacted, that a certain amount of odium attaches to pure food and drug laws. This arises because of the difficulty of securing officers who understand either natural and practical conditions in the manufacture or commerce of these products, and who have been sufficiently trained and developed in all of the sciences which are involved in the study of the origin and manufacture of them, so as to comprehend the possibilities of either truth or error. Unless there is an advance in the action of this Congress in deciding who are to be the judges of purity and adulteration in foods and drugs, over that of previous legislative acts, it is not unlikely that considerable trouble and annoyance will be caused the most conscientious manufacturers and business men rather than those who wilfully adulterate or admix their products. One of the first steps of this Congress should be to make sure that there is sufficient scientific knowledge at our command which can be utilized in establishing standards of purity, etc., and that there are sufficient competent

practical persons able to carry on this work with justice to consumer and producer. A legislation that is based on ignorance is arbitrary and is surely not what this Congress desires. The legislation must be based on knowledge—and this knowledge must be manifest not only in the ability of legislators to frame laws, but they must see far enough that in the application of the laws through the judges of standards, it is not the manufacturer or seller of pure foods and drugs that is to be inconvenienced, but that he who adulterates these products shall be punished.

Some years ago it was considered necessary to present arguments upon the value of the microscope in the study of drugs. It is noteworthy that during the past year scarcely a paper has appeared on this subject in the pharmaceutical world, and it appears that all of our colleges and schools of pharmacy are utilizing the simple and compound microscope and giving a more or less thorough training in the study of botany (particularly of the plant cells and their contents), preparatory to the study of crude and powdered drugs, foods, etc. It has been shown by the author on a number of occasions that the microscope is not only sufficient, but absolutely necessary in some cases in determining the purity of a drug, food or spice. It is needless to repeat that this instrument is safe only in the hands of him who is thoroughly trained in the sciences the subjects of which are involved. The products of the animal kingdom can only be examined authoritatively by the zoologist; those of the plant kingdom by the botanist, etc. It may be necessary to illustrate the above remarks with one or two examples, indicating the value of the microscope to the specialist. Recently a sample of black pepper was submitted to the writer which was supposed to have been adulterated with cayenne pepper. A chemical examination gave no clue to the problem. But by means of the microscope the adulterant was detected with certainty. Some years ago a fruit jelly was upon the market, which was sold at an unusually low price. It was naturally supposed to be adulterated; but with what, was not known until by means of the microscope the presence of a diatom (*Arachnoidiscus Ehrenbergii*) was revealed. The next question was where and upon what does this diatom grow? It was found that it grew only upon certain seaweeds in the waters near Japan, and not upon fruit trees in France, and this led to the conclusion that the jelly was made from

this seaweed. These examples are sufficient to indicate how long are the ways that lead to the solution of the problems that concern this Congress. It may, therefore, be asked how much training shall be represented in its Board of Judges of Standards? Would it not be better to err on the side of having more sciences represented and more men of special training than by limiting the knowledge which this Board shall possess? Some may say that no limit is indicated. It is nevertheless manifest in its prescribing that chemists and medical doctors shall decide on the standards to be adopted and that it does not specify any one who is a student of either of the two kingdoms that yield us our important foods and drugs.

If more attention could be directed rather in the direction of strengthening the scientific part of the work involved by this Congress and assuring the manufacturer of pure products that he will be protected, and that he who adulterates will be liable to punishment, than to the philosophy of food legislation, the cause would be strengthened materially and a desirable condition at a not very far distant day realized. If it were not for the fact that the importance of this subject is scarcely realized even by the chemical analysts themselves, I would not bring it forward in this rather forcible manner. Only recently an analyst of some reputation sent to my laboratory to ascertain the reagents which were employed in detecting adulteration in spices. He desired this information to examine certain products that he had received from another State, in which the quality of the products had been questioned. I replied "that I employed at the most but three or four reagents, including mounting media, and that it was not so much color reactions as it was ability to determine tissues and their contents that was necessary for work of this kind, and that this only would follow prolonged and careful training in the examination of plant tissues and their contents." We know that iodine gives a blue reaction with starch, but we have also seen that our knowledge of the starch grain is far more extensive than this, and that for purposes of identification much other work must be done.

The foregoing remarks apply likewise to many related subjects, as stone cells, pollen grains, etc. In the black pepper examination referred to above, the adulteration was determined by the presence of the characteristic-shaped stone cells of the seed coat of cayenne

pepper. The crucial test is not the absence or presence of tissues or contents, which give a characteristic stain or reaction; but it is what both a micro-physical and micro-chemical examination yield the botanist and pharmacognocist.

Some may object to my remarks in that I lay too much stress on the training necessary for research work of this kind. Time will show that competency in setting standards for, and in examining, foods and drugs is acquired only by proper training. This training cannot be too broad, and at the same time specific. The chemical analyst spends four to seven years in attaining competency. How can any one consider, then, that a few days or weeks are all that is necessary to make one competent to pronounce on commercial food and drug products which require for their examination a a knowledge of the foundation-stones and principles in other sciences of which he may know comparatively little, if anything. A chemist may use a microscope, so may a lawyer, but it is not to be supposed that they can use it with the same degree of certainty and skill as one who has been trained in its use. Of all the instruments yet devised in the prosecution of scientific research, there is none that requires that its user shall be better taught in the foundation and guiding principles of the science in which he engages than the microscope.

The chemist may make a chemical examination of water, but it requires the bacteriologist (or specialist in another department of science) to make a biological examination of the same. The knowledge of the latter is as essential, if not more so, in some cases, than the former, and, in fact, unless made may result in an error in the deductions that are drawn. It may also be said that the chemist may make a chemical analysis of foods and drugs, but a biological examination requires the aid of the biologist, *i. e.*, the specialist in botany and zoology. As in the examination of water, so in the examination of these products, the different sciences mentioned should work conjointly, each contributing its share to the truth. This is the age of specialists, and, even in the different departments of science, we have a further division of labor among experts. We believe that the best efforts of this Congress will be served and materially strengthened if not only the division of chemistry of the United States Department of Agriculture, but the other divisions of the department that can furnish material assistance in this work are

instructed to furnish experts; and if, in addition to the chemists of the American Chemical Society and physicians of the army and navy, the pharmacists of the American Pharmaceutical Association are invited to send representatives. There is no question but that such action—the bringing together of experts in the different departments as its judges of standards—would place the Congress in good faith among all who are concerned in pure food and drug legislation. This part of the subject is deserving of your most earnest consideration, as, to my mind, it is the keystone of all food and drug legislation. When this is decided, there will be no difficulty in framing a law that is at least rational, and which may be perfected as the judges of standards of purity are enlightened and manufacturer, merchant and consumer recognize its justice.

RECENT LITERATURE RELATING TO PHARMACY.

LIMED ALTHÆA.

It is well known that considerable althæa is limed to improve its appearance, and the test for its detection has been treatment with diluted hydrochloric acid, saturation of this with ammonia and addition of ammonium oxalate when the calcium is precipitated.

Fromme (*Ph. Rundschau*, 1898, 631) finds all althæa naturally contains some lime, and that the above test will invariably give positive results, even with unsophisticated specimens, hence is a worthless criterion. He recommends the following test, which affects only large quantities of lime.

Two grammes cut althæa in a small plain filter is washed with 5 c.c. 1 per cent. solution of hydrochloric acid and the filtrate rendered alkaline with solution of soda. No precipitate should occur.

H. V. ARNY.

SEPARATION OF THE TARTARIC ACIDS.

According to A. Hollemann (*Chem. Zeit.*, 1898, 134) these acids can be separated by the fractional crystallization of their calcium salts, racemic acid being usually the first to crystallize out. The three salts can be readily distinguished under the microscope; the dextrogyre being in prisms or rectangular plates; the inactive in quadratic or rhombic crystals; while the racemic salt appears in elongated rhombic plates.

H. V. A.

CONSTITUENTS OF CORK.

E. Kennert gives (*Ph. Centralh.*, 1898, 699) a preliminary report on investigation of cork, in which he confirms the presence of vanillin, which is separated from the ethereal extract by agitation with solution of sodium hyposulphite. Evaporation of the ethereal extract yields a residue, from which, with cold ether, can be separated a wax, which, on boiling with alcoholic potassa, yields an acid and an alcohol which has not yet been fully investigated.

From the ethereal residue mentioned above, after boiling with sodium carbonate and then with potassa, washing and drying, acetic ether extracts cerin, which the author purified and analyzed, finding its empiric formula to be $C_{30}H_{52}O_2$ or $C_{32}H_{54}O_2$. It yields an acetyl and a benzoyl derivative, and is allied to physosterin.

H. V. A.

THE ACTIVE CONSTITUENTS OF DIGITALIS LEAVES AND SEED.

According to Kiliani (*Arch. der Pharm.*, **233**, 311) the leaves of digitalis contain neither the so-called *Digitalin verum* or digitonin, while Keller (Uber die Wertbestunmung von Drogen und galenischen praparaten. Diss. Zürich, 1897) states that *digitalin* and *digitonin* are present. M. Cloetta has gone into this knotty problem, and finds that the leaves as well as the seed contain *digitonin, digitalin, digitoxin* and *coloring matter common to both.* He has not been able to establish the presence of *digitalein* in the leaves. The seed contains much more *digitalin* than *digitoxin*, while in the leaves the reverse is the case.—1898, *Arch. exp. Pathol. u. Pharm.*, **41**, 421.

L. F. Kebler.

ON THE VOLUMETRIC ESTIMATION OF VANILLIN, BY WELMANS.

The method is based on the well-known property of vanillin as a phenol, to form salts with one equivalent of base. The method is as follows: into a 200 c.c. glass-stoppered flask place 1 gramme of vanillin, add 25 c.c. of alcohol and 25 c.c. of semi-normal alcoholic potash, and two or three drops of phenol-phthalein solution. Insert stopple, shake until complete solution results. Then retitrate the excess of alkali by means of a semi-normal hydrochloric acid solution. The normal factor of vanillin is 0·156.—*Pharm. Ztg.*, 1898, No. 71, 434.

L. F. K.

EDITORIAL.

NATURAL AND ARTIFICIAL RUBBER.

Of all the plant constituents there are none of such great economic importance as those that constitute what is called rubber. This is the product contained in the milk vessels of the plants of a number of natural orders, viz.: Euphorbiaceæ, Apocynaceæ, Asclepiadaceæ, Urticaceæ, Lobeliaceæ and Compositæ. These milk vessels were, according to Otto Chimani, first observed by Theophrastus and M. Lister and first anatomically studied by Malphigi. A large number of species yield the commercial rubber and new sources of the article are being described from time to time in the *Kew Bulletin*, see this JOURNAL, April, 1876, and *Notizblatt des Königl. Bot. Gart. u. Mus. Zu Berlin*. According to *Consular Reports*, May, 1898, p. 72, the imports of rubber into the United States during the fiscal year 1897, were: Rubber, free of duty, 35,574,449 pounds, valued at $17,457,976; rubber, dutiable, $297,953; old scrap and refuse for manufacture, 3,653,945 pounds, valued at $113,722.

The U.S. Pharmacopœia recognizes the product of various species of Hevea, which is known as Para rubber. The State of Para does not produce (*Ibid.*, January, 1899) more than two-thirds of the rubber shipped through this port, the balance coming from the States of the Amazon as well as from Peru, Bolivia, etc. There entered the port of Para during the fiscal year 1897-98, 22,257 tons of rubber, and of this amount 11,422 tons were shipped to the United States and 10,796 to Europe.

The principal bearing areas in the State of Para are: The islands in the river Amazon, near the city; the banks of the river Tocantins; the banks of the rivers Xingu, Jary and Tapajos. The upper and lower districts of the Amazon produce the same kind of rubber, but that coming from the upper rivers obtains a slightly higher price, being dryer by the time it reaches the port of shipment.

It appears that the rubber-producing area in this Amazon section, recently discovered and untouched, is hundreds of times larger than that worked heretofore.

Some of the South American countries are seriously giving attention to the cultivation of rubber. Ecuador produces, it is said, every known species of rubber tree in great abundance from the *Ficus dolairia* in the vulgate *Ragasron* to the *Urceola*, the most beautiful of all; the same can be said of Columbia. In these two countries the cultivation of rubber is a new industry. Hitherto, rubber has been obtained from wild trees, but the ruthless destruction of the plants by the greedy rubber seekers, who do not hesitate to cut them down to obtain a trifle more gum, has played havoc with the trade of this coast. In the remote regions of Ecuador, there are still large forests, but inefficient transportation increases the cost. An effort is being made to obtain from the Government an eight-year concession for the exploitation of rubber and quinine in a territory covering from eight to ten square leagues in the Province of Tungurahua.

Maniçoba rubber from Ceara, Rio Grande and Parahyba, States in Northern Brazil, ranks in price second to the Seringueira or Para rubber and is preferred even in certain classes of work to the latter. The interest in the growth of the plant yielding this rubber is steadily increasing, not only in the three States mentioned, but is also extending rapidly throughout Pernambuco, Alagoas and

Bahia, as it seems to give better results with less labor than almost any other agricultural product. The way the greater part of the Maniçoba rubber is produced is to simply cut the bark of the tree, letting the sap run in drops to the base, where by the action of the sun's rays it coagulates and forms an irregular solid mass, which is gathered by the natives and sold to middlemen, by whom it is shipped to America and Europe.

Mangabeira rubber is produced in the States yielding Maniçoba rubber and Sao Paulo. The rubber appears to be an inferior grade, and is used for covering cables, etc. During the past six months (ending December, 1898) several consignments of Mangabeira rubber arrived in Santos from the interior, and were quietly shipped to Europe. Formerly Mangabeira rubber brought only about half as much as that of Para, but the price has risen. It is said to be much harder and therefore preferable for certain purposes.

Florida rubber is a product that cannot be thought of for some time. It is true that the climate is admirably adapted for the cultivation of this tree, as suggested in Consular Reports, May, 1898. The writer also mentions that the camphor tree may also be grown here. While it has been demonstrated that the trees may be grown in Florida, the greatest item for consideration in this connection is the price of labor. So long as laborers, who might collect these products are paid the relatively high wages they receive, the cultivation of these plants for their products cannot be looked upon in this country as being a financial success that is within immediate reach. In this country as well as elsewhere various attempts have been made to manufacture rubber artificially. A patent was taken out some time ago in Germany for making an imitation hard rubber out of sawdust. Another process for making substances resembling rubber was to treat fixed oils mixed with tar or similar distillate products with nitric acid. By interacting between various proportions of nitro-cellulose and bromonitro-toluol or nitro-cumol and its homologues a material resembling rubber, it is said, may be obtained. Upon mixing a glue paste with tungstate of soda the precipitate is said to form an elastic mass under certain conditions. The latest artificial product is a corn rubber which is obtained, according to *Chicago Times* through *Journal Franklin Institute*, 1899, p. 251, from the refuse materials of the glucose factories. The following details will be of interest:

"Corn rubber has almost exactly the appearance of the ordinary reddish brown india-rubber. The process of manufacturing is not perfect enough, however, to make it resist heat as well as india-rubber. This has offered the greatest difficulties to the chemists, who are now working to remedy this defect. The oil of corn, from which principally the rubber is made by some secret process, does not oxidize readily, and those who are working on the corn rubber declare this will be an enormous advantage for the new product. Articles manufactured from it will always remain pliable and not crack. Contrary to reports, this new product has not yet been put on the market. It is intended to go on with its experiments till the success of the new substance is assured, and then to go into its manufacture on an immense scale.

"The corn-oil from which the rubber is made, comes from the germ of the corn and not from the hull. The starchy and glutinous portions of the kernel are used in making glucose and starch, while the corn-oil, heretofore, according to the refiners, has been practically useless. The five refineries of the trust have used 21,000,000 bushels of corn in the last ten months, of which

about 5 per cent. was refuse. Though forty different products are made by the company, still 5 per cent. was practically waste. By utilizing this waste material in making the new product it is calculated that corn rubber can be sold at 6 cents a pound, 2 cents of which will be clear profit. The corn rubber, it is said, will be adapted to nearly all the uses that ordinary rubber is capable of—from bicycle tires to linoleum. The more refined uses to which the rubber is put, however, will still be a closed field, for the composition of corn rubber will prevent its substitution for india-rubber for scientific uses."

It is further stated that the new product may be advantageously mixed with Para rubber, producing a cheaper article of substantially the same quality for ordinary service, as the genuine rubber.

The manifold uses to which rubber may be applied lead us to believe that we are likely to hear of the discovery of new plants yielding this product, the cultivation of the most important species and many attempts in the manufacture of an artificial product.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

HAND-BOOK OF PRACTICAL ASSAYING OF DRUGS AND GALENICALS. A Manual for the Pharmaceutical Student and a Guide to the Practical Pharmacist who has Occasion either to Standardize his own Preparations or to Test the Drugs and Galenicals he Dispenses. By A. B. Lyons., F.C.S. Detroit: Nelson, Baker & Co., Publishers. 1899.

This volume, of almost 250 pages represents all of the progress made in pharmaceutical assaying, since the publication of Lyon's Manual of Assaying, in 1886, and will be found a valuable addition to all pharmaceutical libraries since the original publications of assay processes are widely scattered in home and foreign periodicals.

Some eighty pages are devoted to descriptions of apparatus, reagents, selection and preparation of samples, methods of extracting the drug, methods of assay for drugs by various gravimetric and volumetric processes, and methods for assaying galenicals as extracts, fluid extracts, tinctures, wines and syrups.

The greater portion of the book then takes up forty drugs in detail, for which assay processes have been devised by the author and others; these drugs are generally treated according to the following system: Active constituents, methods of assay (gravimetric and volumetric—and in some cases also physiological; in case of the strychnos, opium and cinchona alkaloids methods for separating the alkaloids are also given), the assay of galenical preparations, and lastly, a statement as to the quantity of the active constituents found by assay.

The following criticisms are made to increase the value of this volume: In the preparation of reagents it would be far preferable to indicate percentage strength in place of some of the terms used—as hydrochloric acid (*B. P.*), *concentrated* ether, etc.; such statements would be valuable for all time, whereas pharmacopœial strength and commercial names are liable to change.

On page 41 the statement is made "that the methods of Schwickerath, Keller and Kebler are modifications of, and in some respects improvements upon, those originally worked out by the author, following the general plan of

Prolliu's short method for the assay of cinchona bark ;" on page 30, in commenting particularly upon Keller's method there is stated that all processes in which ether or even compound solvents are used, and in which an aliquot portion of the solvent is taken to complete the assay, "it may be expected that the *result of the assay will be high.*" The distinctively characteristic feature of Keller's method in the assay of crude drugs is the addition of water to cause the lumping together of the powder drug thus enabling the solvent to be poured off clear, and this feature has been adopted in the present volume. This addition of water was undoubtedly the main factor, causing *low results* in some assays of belladonna leaves recently made by the writer (AM. JOUR. PHARM. 1899, 105).

In processes in which an aliquot portion of the solvent is used, the quantity of drug represented by this portion should *always* be stated; this has been omitted in some cases, and is somewhat puzzling, as one then does not know whether the particular process makes allowance for extractive.

In giving the percentages of active constituents in the various drugs, it would be of great value to state by what assay processes these results were obtained; this could only be exceeded in value by incorporating comparative assays of the same drug by the various methods.

An additional word or two occasionally would be of considerable help in understanding a process; this is particularly the case when a drug is to be treated with a solvent which has for its object the removing of some interfering substance before proceeding with the assay proper. For example, Hager's method of estimating aloes in mixtures, page 100, would be better understood if the statement were made that the first extraction with the absolute alcohol, chloroform and benzol mixture removes other resinous substances (jalap resin in particular), and that the portion *insoluble* in this mixed solvent is to be extracted with alcohol.

The exact details of official assay processes are only given under cinchona; under opium the reader is referred to the original publication by Dr. Squibb in the ephemeris, while under nux vomica no mention of any kind is made of the official process; it seems to the writer that these processes should be given prominence in the book, particularly as the assay processes of the U.S.P., 1880, for cinchona and opium have been accorded space.

Under opium, page 206, in referring to the correction for impurities in the crude morphine, the lime water and ash methods are mentioned; in the latter the statement is misleading, the factor usually employed for calculating ash to calcium meconate (?), the supposed morphine impurity, being omitted.

The method of E. Dieterich adopted by the German Pharmacopœia is his original process; no mention is made of the improvement of the process by substituting acetic ether for ether.

On page 213 (401) the quantity of tincture of opium used, 160 c.c., should be 150 c.c. to agree with the process to which reference is made.

On page 214 (402) in the processes for assay of extract of opium, the quantities used do not accord with those in the cross-references; in these cases particularly the quantity of drug represented by the aliquot portion taken should be stated.

The following typographical errors were noticed in a careful perusal of the work, and should be added to the published list:

Page 37, line 11 from top, read 100 grammes.
Page 109, line 3 from bottom, read alkaloids.
Page 147, line 8 from bottom, read alternative.
Page 155, line 4 from top, read segregates.
Page 190, line 8 from bottom, read fluid.
Page 208, line 15 from top, read 51·5 c.c. instead of 15.5 c.c.
Page 214, line 5 from top read (384) instead of (348).

FRANK X. MOERK.

THE PHARMACEUTICAL FORMULARY. A Synopsis of the British, French, German and United States Pharmacopœias and of the Chief Unofficial Formularies, Being the Twelfth Edition of Beasley's Pocket Formulary. Edited by J. Oldham Braithwaite. London: J. and A. Churchill. Philadelphia: P. Blakiston's Son & Co.

This very convenient synopsis comes to us in a very much improved form. The first impression which strikes the reader favorably is the black type used for the titles, enabling the busy pharmacist to find quickly the preparation sought for. A judicious pruning has reduced the number of pages from 517 in the old edition to 464 in the new. A change in the label will be noticed by those who are familiar with the work; the old title, Pocket Formulary, Beasley, being changed to Beasley's Formulary—Braithwaite. The work has been carefully edited, and will be a valuable addition to the pharmacist's library and dispensing counter. J. P. R.

THE COMING AGE. A Magazine of Constructive Thought. The Coming Age Company, Copley Square, Boston, and the Midland Publishing Company, St. Louis. Subscription, $2 per annum.

Prof. J. U. Lloyd, whose entrance into the field of general literature, was so successfully marked by the appearance of "Etidorhpa," a lengthy review of which appeared in the November, 1895, issue of this JOURNAL, has become a contributor to the *Coming Age*, and his first paper under the caption "Do Physicians and Pharmacists Live on the Misfortunes of Humanity?" will appear in the April issue. This question has no doubt occurred many times to the minds of physicians and pharmacists alike, and we are especially glad that it has been taken up by Professor Lloyd for treatment.

The *Coming Age* is a new monthly magazine which makes its entrance amid modern literature, with the advent of the year 1899. The title of the magazine is quite indicative of its character, and while being, to a certain extent, ethical in its tendencies, deals with questions of general interest, and such as are in the line of modern progressive thought.

INDEX CATALOGUE OF THE LIBRARY OF THE SURGEON-GENERAL'S OFFICE OF THE U. S. ARMY. Second Series, Vol. III. C-CZYGAN.

This volume includes 11,112 author titles, representing 4,873 volumes and 10,690 pamphlets. It also contains 10,636 subject titles of separate books and pamphlets, and 34,314 titles of articles in periodicals.

MASSACHUSETTS BOARD OF REGISTRATION IN PHARMACY. Thirteenth Annual Report for the Year 1898. Boston.

In the Report it is emphasized that there is an advance in "the requirements of the pharmacist on the lines of analysis, microscopy and application of reme-

dies to disease, resulting in the drug store of the future becoming one of the most helpful, economic, time-saving and reliable aids to modern progress." On another page are submitted "some of the answers received, clearly exhibiting the need of great care in granting certificates of registration in pharmacy in this Commonwealth." These answers used to appear ludicrous, but we are inclined to look upon this matter more seriously, and wonder what is the use of making an advance in requirements of candidates, when their answers are as bad as they were thirteen years ago. Surely this indicates that applicants for apprenticeship ought to be examined first and the proficient only receive certificates indicating that they have the mental calibre for learning the drug business. When this board and other boards begin at the foundation, then they will not receive the astounding answers, and an advance in requirements will accomplish all that is claimed.

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The problem of framing practical laws for regulating the sale of poisons is doubtless one of the most difficult that our legislators encounter.

Too frequently the ethics of the question causes the production of a theoretical rather than a practical measure, with the result that no good is accomplished.

The Committee on Legislation of the Pennsylvania Pharmaceutical Association, of which Wm. L. Cliffe is Chairman, has proposed a rational and intelligent amendment to the proposed Senate Bill No. 18. This amended bill will accomplish what is practically desired for the protection of the profession involved as well as the public. The position of the Philadelphia Association of Retail Druggists on the measure originally introduced is seen in the resolutions passed at its last meeting and which are given in another part of this JOURNAL. The following is a copy of the bill as amended by the Legislative Committee of the Pennsylvania Pharmaceutical Association:

FILE OF THE HOUSE OF REPRESENTATIVES.

No. 153. Session of 1899.

As amended by the Legislative Committee of the Pennsylvania Pharmaceutical Association.

AN ACT

To regulate the sale and use of opium, morphine, codeine, cocaine and their various salts or chloral, and to prevent the injurious use of same.

SECTION 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met and is hereby enacted by the authority of the same that any registered druggist or apothecary, or any manufacturer of opium, morphine, codeine, cocaine or their various salts or chloral may sell the same to any registered druggist or apothecary, or to any legally qualified and authorized practitioner of medicine, surgery or obstetrics, human, dental or veterinary. Any druggist or apothecary may sell or deliver to any person other than such practitioner such opium, morphine, codeine, cocaine or their various salts or chloral upon and only upon first receiving an order or prescription for the same, signed by any such practitioner, stating clearly what quantity or quantities, and at what time or times the same shall be sold or delivered and the person for whose use the same is ordered or

prescribed, and such sale and delivery shall be in strict compliance with such order or prescription, which shall be retained by such druggist or apothecary and by him safely kept. But no such order or prescription shall be honored by any druggist or apothecary longer than one week after it bears date and shall be only filled once. Any practitioner of medicine, surgery or obstetrics legally authorized to practice as aforesaid, may sell or administer to or prescribe for any person such opium, morphine, codeine, cocaine or their various salts or chloral when, and as and only when and as in his judgment actually conducive to such person's physical welfare, but all prescriptions or orders which he shall issue for procuring the same from a druggist or apothecary shall bear the date on which the same shall be by him signed. Any person may administer to himself or others any opium, morphine, codeine, cocaine or their various salts, or chloral under and subject to and in accordance with the order and directions of any such practitioner of medicine, surgery or obstetrics, but not otherwise.

SEC. 2. No person except as above set forth shall sell, give away, deliver or cause to be sold, given away or delivered to any one or administer or cause to be administered to himself or any other person, or use or cause to be used in any manner any opium, morphine, codeine, cocaine or their various salts or chloral; and any person so doing and any person violating any of the provisions or requirements of this act shall be deemed guilty of a misdemeanor, and upon conviction shall be sentenced to pay a fine not exceeding $500 and undergo an imprisonment not exceeding one year or either or both in the discretion of the court.

PHILADELPHIA ASSOCIATION OF RETAIL DRUGGISTS.

More than usual interest was taken in our meeting of March 3d, a larger number being present than at any previous meeting. The bond of Treasurer E. R. Smiley for $1,000 was approved, and the West Philadelphia Title and Trust Company named as the bank for depositing the funds of the Association.

Mr. W. L. Cliffe called the attention of the Association to a bill which had been presented at Harrisburg relating to the sale of opium preparations, etc. President McIntyre appointed Messrs. Cliffe, Finnerty and Swain to act as a committee, and draft a set of resolutions protesting against the passage of such an act, as it would be against the interest of every retail druggist in the State of Pennsylvania, as they would require a prescription for every sale of paregoric and similar preparations.

President McIntyre has taken the resolutions to Harrisburg, to place in the hands of the chairman of the committee which has the obnoxious bill in charge. The following is a copy of resolutions protesting against passage of Senate Bill No. 118:

PHILADELPHIA, March 3, 1899.

To the Honorable, the Committee on Public Health and Sanitation of the General Assembly of the Commonwealth of Pennsylvania:

WHEREAS, A bill (No. 118, Senate file) has been introduced, designed for the purpose of regulating the sale of opium and cocaine, and preventing the inju-

rious use of the same, which bill is so broad in its provisions as to include all harmless remedies for domestic practice containing these drugs; therefore, it is

Resolved, That we, the Philadelphia Association of Retail Druggists, do hereby place on record our unqualified approval of any practical plan for the accomplishment of the purpose for which Senate Bill No. 118 is designed, yet we do respectfully protest against it as at present constructed, as being too sweeping in its restrictions, inasmuch as it would prevent the sale of harmless domestic remedies which are in proper public use all over the civilized world, and recognized by all nations having a pharmacopœia or other accepted standard formulæ.

Resolved, Further, that inasmuch as the Legislative Committee of the Pennsylvania Pharmaceutical Association is engaged in preparation of a bill for submission to the General Assembly regulating the sale of narcotic and other poisons, which bill will be ready for presentation to your honorable body shortly, we do respectfully ask your indulgence and pray that action on the pending bill may be suspended and a hearing vouchsafed by your honorable body to the said Committee of the Pennsylvania Pharmaceutical Association, with proper consideration of the bill proposed by them.

And we will ever pray, etc.

PHILADELPHIA ASSOCIATION OF RETAIL DRUGGISTS.

[Signed] WM. M. MCINTYRE, *President.*

W. A. RUMSEY, *Secretary.*

A prospectus has been given to each member of the Executive Committee, together with the names and addresses of all druggists who are not members of the Association. The druggists will be called on, and it is hoped that they will take an interest in the Association, and become members of the same.

The next meeting will be held in the museum of the Philadelphia College of Pharmacy, Friday, April 7th, at 3 P.M.

W. A. RUMSEY, *Secretary.*

THE PHILADELPHIA COLLEGE OF PHARMACY.

ANNUAL COMMENCEMENT.

The Annual Commencement of the Philadelphia College of Pharmacy, for 1899, will be held at the Academy of Music, Broad and Locust Streets, on Wednesday evening, April 19, 1899, at 8 P.M. Tickets may be had of the Actuary, Thomas S. Wiegand, 145 North Tenth Street.

ANNUAL MEETING OF ALUMNI ASSOCIATION.

The thirty-fifth Annual Meeting of the Alumni Association of the Philadelphia College of Pharmacy will be held in Alumni Hall, at 145 North Tenth Street, Philadelphia, on Monday afternoon, April 17, 1899, at 2 P.M.

The President of the Association, Jas. C. Perry, '91, will deliver the annual address. The Secretary, Treasurer and Finance Committee will submit their annual reports, and the annual election of officers will take place.

Members are requested to be present, or, if unable to do so, to notify the Secretary, Wm. E. Krewson.

ANNUAL RECEPTION OF ALUMNI ASSOCIATION.

The Annual Reception of the Alumni Association of the Philadelphia College of Pharmacy, to the Graduating Class of 1899, will be held in the College Building, 145 North Tenth Street, on Monday evening, April 17, 1899, at 8 P.M.

The following programme will be rendered:

Address to the graduating class by Mahlon N. Kline, of Philadelphia.

Presentation of Gold, Silver and Bronze Medals, and Prize Certificates.

Annual Class Oration, by Wm. Allen Chamberlain, of Indianapolis, Ind.

Class Poem, by Robert John Hoagland, of Peoria, Ill.

Class History, by Arthur Bowles Fleming, of Chambersburg, Pa.

Class Prophecy, by Christopher Koch, Jr., of Philadelphia.

EXAMINATIONS.

The following is a copy of the questions given to the first and second year classes at their recent examination. Those in operative pharmacy, analytical chemistry, botany and pharmacognosy were practical, and conducted in the respective laboratories; the others were written:

FIRST YEAR EXAMINATION.

THEORY AND PRACTICE OF PHARMACY.

A—(1) Describe the difference in the process, appearance and method of use between a granulated salt and a granulated effervescent salt. (2) Define Exsiccation. (3) State the objects of the process. (4) Define Digestion, Expression and Maceration. (5) Describe Repercolation.

B—(1) What are medicated wines? (2) What are the objections to the use of wine as a menstruum? (3) Describe a liquid which possesses all of the advantages of wine as a menstruum and none of its disadvantages. (4) Define Extracts and state their uses. (5) Are they uniform in quality as found in commerce?

CHEMISTRY.

C—(1) Describe the element Sulphur in its several physical modifications and its commercial forms. (2) Describe the several oxides of sulphur and state how each may be formed. (3) Give an example of an official sulphite, sulphate and thiosulphate, using the chemical formula in each case.

D—(1) Write a reaction for the production of Hydrogen Dioxide. (2) What are the characters and uses of Hydrogen Dioxide, and what tests will show its presence? (3) What is the common name of Hydrogen Nitride and how is it formed? Give tests for its recognition.

MATERIA MEDICA (PHYSIOLOGY).

E—Digestion.—(1) Name the seven stages of digestion. (2) Name the digestive ferments present in saliva, gastric juice and pancreatic juice, and state the kind of food upon which each of them acts. *The Blood.*—(3) State the color of arterial blood and venous blood and the side of the heart in which each is found. (4) In what three kinds of vessels does the blood circulate, and in which of these is nutriment yielded to the tissues? *Animal Heat.*—(5) What

is the normal temperature of the body, and what is the daily variation? At what time in the twenty-four hours is it lowest and highest? *Respiration.*—(6) What is the object of respiration and what are the number of respirations per minute? (7) What change is produced in the air by respiration? How many cubic feet of pure air does each person need hourly?

BOTANY.

F—(1) How would you distinguish between a dicotyledonous root and a dicotyledonous rhizome? Give a drug example of each. (2) How would you determine if an herb or leaf drug has been properly dried and preserved? (3) By what means is pollination in the flowers of Vanilla effected? (4) What terms are used to distinguish such fruits as Cardamom, Colocynth, Illicium and Cubeb? (5) Mention and describe a drug flower that possesses an inferior ovary; also an official fruit that has a superior ovary. (6) State briefly the characteristics of the flowers of the N. O. Compositæ and mention three drug samples. (7) What is Lupulin? (8) What is the difference between an albuminous and an ex-albuminous seed? Give a drug example of each. (9) What is Mace? (10) State briefly how you would proceed to determine whether a lot of ground black pepper is pure?

COMMITTEE.

G—(1) Give the chemical formula of so-called Carbonic Acid. (2) Describe its physical properties. (3) What effect has the gas upon the system when inhaled in large quantities? (4) In what form is it often taken into the stomach? (5) Give a process for preparing it in this form for internal administration.

H—(1) In a percolation experiment how may the end of the process be determined? (2) Explain the advantages of previous maceration in percolation. (3) How would you select the menstruum for percolating a drug, if you were compelled to originate a formula for a tincture of the drug? (4) How would you control the rate of flow of the percolate?

I—(1) Write the chemical formulas of Hydrogen Oxide, Nitrogen Tetroxide, Hydrogen Sulphite, Sodium Sulphate and Calcium Oxide. Describe official Sulphuric Acid and give briefly its process of manufacture.

K—(1) A retail druggist buys the following goods: $\frac{1}{2}$ dozen Expectorant at $8.00, $1\frac{5}{12}$ dozen Lithia Tablets at $3.50, $\frac{1}{2}$ dozen Worm Syrup at $1.75, $4\frac{7}{8}$ gallons Alcohol at $2.60 and $2\frac{1}{4}$ pounds Subnitrate of Bismuth at $1.50; make a bill in correct form for the above, carrying out the amount of each item and give the total. (2) What would a profit of 50 per cent. on this bill yield him? (3) State what additional profit would be yielded if the retail druggist received a discount of 2 per cent. for cash.

OPERATIVE PHARMACY.

(2) *Granulated Salt.*

Acetic Acid . . . . 20 c.c.
Sodium Carbonate . . . . 20 c.c.

Water of each, sufficient. Make Sodium Acetate. Put in the small wide-mouth bottle.

(1) *Specific Gravity.*

Determine the specific gravity of the liquid contained in the bottle labelled "specific gravity liquid;" put all calculations on the sheet of paper, with your name and examination number.

(3) *Solution of Ferric Sulphate.*

Ferrous Sulphate	52·8 gm.
Sulphuric Acid	6 c.c.
Nitric Acid	5·5 c.c.

Water sufficient to make 100 c.c. Make solution of Ferric Sulphate by the U. S. P. formula. Put in the 4-ounce bottle.

PRACTICAL BOTANY.

(1) Make sections of specimen No. 1 and determine whether a root or stem; monocotyledon or dicotyledon. Draw a diagram and indicate the tissues and their arrangement. Jamaica ginger. (2) What is the name of this drug? Make a drawing indicating the parts; also make a transverse section and indicate in a diagram the characteristic features. Fennel. (3) Purchased for powdered mustard. Determine its purity and state on what you base your determination. Adulterated with 25 per cent. of wheat middlings. (4) Determine the following crude drugs and powders. (*a*) Stramonii Semen; (*b*) Illicium; (*c*) Chenopodium; (*d*) Arnicæ Flores; (*e*) Anthemis; (*f*) Powdered Nux Vomica; (*g*) Maranta; (*h*) Lupulin; (*i*) Nux Vomica.

SECOND YEAR EXAMINATION.

THEORY AND PRACTICE OF PHARMACY.

A—Water.—(1) Under what official titles is Water designated in the U.S.P.? (2) How is the purity of official Water determined? (3) What metallic impurity is sometimes found in Water supplied to cities and towns? State the origin of such contamination. (4) Why is distilled Water directed in many official preparations? (5) By what simple test may "hard water" be recognized? (6) Is colorless, transparent, odorless Water always pure?

B—Sugar.—(1) Give the official name and definition of Sugar? (2) From what sources is it obtained? (3) Describe the best form of Sugar for making pharmaceutical syrups. (4) What impurities are found in Sugar? (5) Name the substance often added to Sugar to make it appear white. (6) What is Rock Candy? (7) How is it made? (8) What is Treacle? (9) If you were to get a prescription for Syrupus Fuscus, what would you use?

C—Ether.—(1) How is Ether made? (2) What are its uses in pharmacy? (3) State its medical properties. (4) What is the specific gravity of official Ether? (5) Is its vapor heavier or lighter than air? (6) How do you recover Ether from percolates in making oleoresins? (7) State what advantages Chloroform has over Ether for pharmaceutical purposes.

D—Glycerin.—(1) How is Glycerin made? (2) What are its uses in pharmacy? (3) What are its uses in the arts? (4) State its official specific gravity. (5) What is its specific volume? (6) How many fluid ounces are there in an avoirdupois pound of official Glycerin?

E—Benzin.—(1) Give the official definition of Benzin. (2) What are its uses in pharmacy? (3) What is its specific gravity? (4) How does it differ from Benzol? (5) How is Benzol made? (6) What precautions are necessary in using Benzin?

CHEMISTRY.

F—(1) State how Aluminum occurs in nature. (2) Describe the metal and mention the processes for its preparation. (3) Give the formula for Alumini Hydras, for Alumen, for Alumen Exsiccatum. (4) Describe the appearance of each of these.

G—(1) What is "White Arsenic?" Describe it and give the chemical formula. (2) Enumerate the most important tests for arsenical poisoning. (3) Give the exact chemical name and formula for Sodii Arsenas.

H—(1) Mention the most important ores of iron, stating their chemical composition. (2) Describe the several varieties of manufactured Iron, noting their physical and chemical differences. (3) Give the formulas of Ferri Oxidum Hydratum, of Ferri Sulphas and of Ferri et Ammonii Sulphas.

J—(1) What are the sources in nature of Phosphorus and Phosphoric Acid? (2) What is a Superphosphate? Give the reaction for the production of Superphosphate of Lime. (3) What is meant by "Reverted Phosphoric Acid" in a fertilizer?

K—(1) What is the difference between Mortar and Cement? (2) Give the chemical formula of Gypsum and state what products are made from it. (3) What is the chemical composition of pure Clay? Mention some of the products made from Clays.

MATERIA MEDICA.

L—Jalap.—(1) Give the official name and botanical names, habitat and natural order of the plant. (2) Give a brief description of the drug and the way in which it is prepared for the market. (3) What is its chief constituent, and the requirements of the Pharmacopœia concerning it? (4) State the part of the body upon which Jalap acts, its medical properties and its dose. (5) Name the False Jalaps; which of these yields a resin identical with the resin of Scammony?

M—Compositæ.—(1) State briefly the botanical characters of its flowers. (2) Give the Latin and English names of the official flowers. (3) Which of these flowers yields a poisonous neutral principle? Give its dose and action. (4) State the medical properties of Oil of Erigeron and its color when efficient. (5) Name a root, a rhizome and an herb drug derived from this order.

N—Cayenne Pepper.—(1) Give its official and botanical names, natural order and habitat. (2) Describe briefly the official part and state its principal constituent and the amount present. (3) What effect does this drug have upon digestion and the skin? (4) Name a liquid alkaloid yielded by the same order. (5) State the effects of the latter upon the heart and digestion when used to excess.

O—Alkaloids and Glucosides.—(1) *Solanaceæ.*—Give the botanical names of the plants yielding mydriatic alkaloids, and name three of these alkaloids. (2) *Rubiaceæ.*—Name an emetic and two febrifuge alkaloids and the plants from which they are derived. (3) Name the alkaloids present in Quaker Buttons, their doses and a chemical and physiological antidote. (4) *Calabar Bean.*—

Name the alkaloids derived from it, and state its effect upon the eye. (5) Name the alkaloids derived from Monkshood and state their effect upon the heart and circulation. (6) Name the glucosides present in Uva Ursi, Bittersweet, Liquorice Root, Willow Bark.

P—Umbelliferæ.—(1) State briefly the botanical characters of the order. (2) What is the chief constituent yielded by most of the order, and in what part is it contained? (3) Name a poisonous alkaloid derived from a fruit of this order. (4) What Athenian philosopher was put to death by it, and what is its action upon the motor nerves? (5) Name two official gum resins derived from this order.

ANALYTICAL CHEMISTRY.

For the examination in qualitative inorganic analysis the class was divided into two sections. The candidates were first given a written examination on the branch. The questions were as follows:

FIRST SECTION.

A—Give the means of detecting HCN, HCl, HI and HBr when all are present in a solution of their salts.

B—How would you distinguish the salts of H_2SO_4 $H_2S_2O_3$ and H_2SO_3 from each other?

C—(1) How would you test sulphuric acid for nitric acid? (2) How would you test nitric acid for chlorine?

D—(1) Name three salts which are soluble in water and whose aqueous solutions have alkaline reaction to litmus paper. (2) Name three salts which are soluble in water and whose aqueous solutions have acid reaction to litmus paper. (3) Name three salts which are soluble in water and whose aqueous solution are neutral to litmus paper.

E—Should pure hydrochloric acid leave a residue upon evaporation?

F—Describe the behavior of calcium during the analysis of a solution containing it and phosphoric acid for bases.

G—A certain official salt occurs in orange-yellow, crystalline pieces which are odorless, or nearly so, and soluble in water. The aqueous solution is acid to litmus paper, yields a brownish-red precipitate with NH_4OH, a blue one with $K_4Fe(CN)_6$, and a white one insoluble in HNO_3 with $AgNO_3$. What is the name of the salt?

SECOND SECTION.

A—A solution containing ammonium salts is to be tested for potassium salts. Tell how you would prepare the solution for the application of a reagent to precipitate the potassium. Name the reagent you would use and give its chemical formula.

B—Describe the chemical test by means of which you would distinguish between: (1) The official Chlorine Water and Hydrochloric Acid. (2) Sodium Bicarbonate and Sodium Borate.

C—(1) Name three Salts of Zinc which are soluble in water. (2) Name three Salts of Calcium which are insoluble in water.

D—How would you test Potassium Iodide for Chloride?

E—What compounds are formed upon mixing: (1) KOH and $HgCl_2$. (2) NH_4OH and $HgCl_2$. (3) $Ca(OH)_2$ and Hg_2Cl_2. (4) NH_4OH and Hg_2Cl_2.

F—Name the different compounds into which Zinc enters in succession during the analysis of a solution containing a soluble salt of it.

G—A certain official salt forms heavy, colorless crystals or crystalline masses, which are odorless and soluble in water. The aqueous solution reddens blue litmus paper. With NH_4OH it yields a white precipitate; with an excess of H_2S a black one; with KI a red one, soluble in an excess of the reagent, and with $AgNO_3$ a white precipitate, insoluble in HNO_3. What is the name of the salt?

In addition to answering the questions submitted to his section, each candidate was required to detect the bases and acids in a mixture of salts, some of which were soluble in water, and others insoluble in water.

Time allowed for written examination, one hour; for analysis, three hours.

SECOND YEAR EXAMINATION.

PHARMACOGNOSY.

(1) Give the Pharmacopœial names of all the crude drugs in the collection before you. A collection of about fifty crude drugs in small fragments. (2) Identify the following powders. State approximate degree of purity of each and on what you base your determinations. Draw any characteristic features. Stramonium seed, hyoscyamus leaves, red cinchona, compound licorice powder and powdered opium containing 25 per cent. "wheat middlings." (3) Determine the value of the specimen of Strophanthus. (4) What is contained in the sediment of the specimen of urine? Draw any characteristic features. An alkaline urine containing phosphates, ammonium urate and bacteria.

OFFICIAL LIST OF SPECIMENS FOR SECOND YEAR EXAMINATION.

(1) Aqua Menthæ Piperitæ. (2) Tinctura Cardamomi Composita. (3) Linimentum Chloroformi. (4) Tinctura Aurantii Amari. (5) Pulvis Cretæ Compositus. (6) Sodii Bicarbonas. (7) Ammonii Chloridum. (8) Potassii Nitras. (9) Magnesii Sulphas. (10) Acidum Sulphurosum. (11) Belladonnæ Radix. (12) Granatum. (13) Conium. (14) Aconitum. (15) Digitalis.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, March 21, 1899.

The regular monthly Pharmaceutical Meeting was held in the Museum of the College with George M. Beringer in the chair.

The meeting was very well attended, and, considering the number of papers presented together with the interest manifested in the discussions, was one of the most successful of the present series.

F. W. E. Stedem was the first speaker on the programme and read a paper containing useful suggestions for practical pharmacists, and having the title "Shorter Methods for the Preparation of Some Pharmacopœial Products." (See page 162.)

In discussing methods for the preparation of tincture of iodine, Mr. Wallace Procter alluded to a method which is simple and expeditious. It consists in placing a layer of absorbent cotton in the lower end of a test tube which has been perforated (or a small cylindrical funnel may be used), then introducing the

iodine and afterward adding another layer of cotton, the whole being then suspended in a vessel containing alcohol. The principle involved is that of circulatory displacement. The registrar, Mr. Wiegand, said he had used this method over twenty years ago with entire success.

In commenting on processes for the medicated waters the chairman, Mr. Beringer, favored solution of the medicating ingredient in either hot or cold water. Remarking further on this subject Mr. Stedem said that he never found any trituration method satisfactory. Dr. Lowe was inclined to the use of hot water for effecting solution of the oils. Professor Ryan said that it was strange that the Pharmacopœial Committee should adopt methods which were so impracticable as those directed for the medicated waters. He agreed with the chairman that these can be most readily prepared by simple solution in either hot or cold water.

A paper entitled "Japan Wax as a Substitute for Beeswax in the Official Ointments and Cerates," was presented by Robert C. Pursel, a student of the College, and will be published in full in a later issue of this JOURNAL. In summing up his observations the author found that Japan wax is a very good substitute for beeswax in nearly all of the official ointments and in all of the official cerates. The products made with Japan wax were slightly darker in color than those made with beeswax, but the difference was not sufficiently pronounced to be considered a serious objection. While the melting-point of Japan wax was found to be lower than that of beeswax, its composition appears to be firmer, and hence a less quantity is required to give a preparation the desired consistency. The main points, however, which were advanced in favor of Japan wax were those relating to its purity and cost as compared to beeswax. The results of the author's experiments showed that there is considerable difficulty in obtaining pure beeswax (one of its adulterants being Japan wax), while on the other hand pure Japan wax is readily obtainable at about one-fourth the price of beeswax.

After examining a sample of Japan wax which accompanied the paper, Professor Remington asked with a view to its future utility in pharmacy, whether this product can always be obtained of uniform quality. Mr. La Wall, in replying to this question, said that no less than 20,000 pounds had come under his notice, and that in only one case was it adulterated, the adulterant being starch. He said that on exposure it becomes slightly yellowish. Others taking part in this discussion were the chairman and Messrs. Stedem and Meyer.

"Some Further Observations on Extracts Made with Acetic Acid," was the subject of a communication by Wm. B. Thompson, which will be published in a subsequent issue of this JOURNAL. Samples of acetic extracts made by Messrs. E. R. Squibb & Sons, and corresponding alcoholic extracts made by Messrs. John Wyeth & Bro., were exhibited for purposes of comparison. While claiming that we must ultimately depend upon clinical experience to determine the value of medicines, the author admitted that certain assays and tests furnished reliable information in regard to the drugs to which they were applied, and that in this respect many of the acetic extracts merited our favorable consideration. He inclined to the belief, however, that the peculiar aroma or vinous odor which belongs to alcoholic extracts, particularly after having been kept for some time, entitled them to superior rank. In the case of the acetic extracts he thought that the odor of the acid menstruum prevailed, not only

masking the odor of the drug but being less agreeable than the odor developed in alcoholic extracts.

In discussing this subject, Professor Remington said that it was one in which he had long been interested and that his early views in regard to the use of acetic acid as a menstruum were incorporated in the first edition of his "Practice of Pharmacy." Continuing, he said that we have long been suffering under the enormous alcohol tax and that a remedy in the case of some preparations has been found in acetic acid. He did not claim that all of our alcoholic extracts could be replaced by acetic extracts, but was satisfied that many of them could be so replaced. In regard to the permanency of acetic extracts he remarked that he had samples in his cabinet which were fifty years old and still in good condition. In regard to the mellowing of the fluid extracts to which Mr. Thompson referred, Professor Remington said that fluid extracts were stored by manufacturers more to get rid of the precipitates than to develop aroma. He said that the acetic extracts also have an aroma, and referred in this connection to the development of ethyl acetate when alcohol and acetic acid are used together as a menstruum. The odor of the acetic ether is not present at first, but develops on standing. To illustrate this he alluded to the circumstance that Dr. Squibb introduced a compound solution of opium, the original menstruum being alcohol, water and a little acetic acid. The odor of ethyl acetate was developed by age and he found that physicians wanted the *old* compound solution of opium. He then changed the formula by adding ethyl acetate to the solution at once and leaving out the acetic acid. Professor Remington said that he was glad that Mr. Thompson brought up the subject of aroma, and that the question as a whole, was one meriting the careful consideration of pharmacists.

With regard to the name "Acetracts," he said that there should be some distinctive title to distinguish these preparations; the difference in cost is great and the temptation to substitute a fluid extract (made with acetic acid) for the official preparation difficult to resist; if a doctor orders a fluid extract he should get only the U.S.P. alcoholic preparation; if the doctor orders a fluid acetract he can only mean a fluid extract made with acetic acid.

Mr. J. W. England thought that clinical tests would be necessary to establish the efficiency of the acetic acid extracts. He referred in this connection to some of the incompatibilities which would be encountered as, for instance, the development of ethyl acetate in a prescription containing alcohol and an acetic extract, and also the chemical incompatibility of a prescription calling for acetic extract of digitalis and ammonium carbonate.

Others participating in the discussion of this paper were the chairman, Mr. Stedem, and Professors Ryan and Moerk.

Prof. C. B. Lowe presented a paper on "The United States and British Pharmacopœias," which embodied some interesting comparisons. One of the most important criticisms which he made was that in reference to the dissimilarity in strength of many corresponding preparations found in the two books, notable examples of this difference being furnished by the two classes, the tinctures and the acids.

The paper will appear in a later issue of this JOURNAL. Professors Remington, Ryan and Messrs. Beringer and Thompson took part in the discussion of this paper.

A valuable paper on "The Estimation of Nitrates and Ammonia in Water" was read by Prof. F. X. Moerk (see page 157).

Christopher Koch, Jr., presented a communication on "A Proximate Analysis of Yellow Pine Bark" (see page 164).

Professor Remington directed attention to a beautiful specimen of asbestos which was presented by Mr. Mattison, a student of the College. Professor Lowe exhibited samples of morphine and quinine, the former being in the form of small cubes, so as not to be mistaken for the latter. The samples of alkaloids represented products of the New York Quinine and Chemical Works.

On motion, the meeting adjourned.

THOMAS S. WIEGAND, *Registrar.*

OBITUARY.

WILHELM MERCK, the senior member of the chemical manufacturing house of E. Merck, died in Darmstadt, on January 12, 1899. He may be said to be one of the fathers of the chemical industry of Germany, and the following sketch was taken from *Merck's Market Report:*

"He was born in Darmstadt on October 11, 1833. His father, the Grand-ducal Superior Medicinal Councillor and Apothecary, Heinrich Emanuel Merck, was a great-grandson of Johann Heinrich Merck, known in literary history as a friend and critic of the poet Goethe; and he was a lineal descendant of Jacob Friedrich Merck, who in 1668 founded the Merck Pharmacy in Darmstadt, from which grew the present Merck Chemical Works. Wilhelm Merck's preparatory education was obtained in the humanistic and technologic high schools ("Gymnasium" and "Gewerbeschule") of his native town. His first introduction into the study of chemistry, which he had resolved to make the pursuit of his life, was given him by Remigius Fresenius. Later on, his steps in this science were guided by Loewig, at the University of Breslau. Thence, he was called back to Darmstadt by the death of his father, at that time the head of the Merck establishment. His scientific attainments, however, were not yet adequate to his ideal conception; and so he went abroad once more for the purpose of extending the scope of his knowledge. The celebrated chemist, A. W. Hofmann, was at that time teaching in London, and Wilhelm Merck remained several terms under his tuition; after which he spent one semester in Wurtz's laboratory in Paris; thereupon returning to Darmstadt, where he joined his elder brothers, Karl and Georg, in the conduct of the Merck house. After Georg Merck's death, in 1873, Wilhelm Merck assumed control of the laboratories and works, while to his brother Karl fell the task of directing the commercial operations of the house. When Karl Merck died, in 1885, the surviving brother, Wilhelm, became the head of the house, the affairs of which he then continued to manage with the assistance of his nephews. The energy and wisdom with which he carried out this task is best demonstrated by the facts that the number of employees in the manufacturing establishment of E. Merck is at present nearly twenty-fold what it was when Wilhelm Merck entered into the administration of the house, in 1860; and that, during his continuance in the firm, it established the branch houses in New York, London and Moscow. The New York branch, in 1889,

developed into the independent house of Merck & Co., in which the family name of the Darmstadt establishment is borne by a son of the deceased—George Merck. (The latter and Theodore Weicker, editor of *Merck's Report*, constitute the American firm.)

"Wilhelm Merck, besides his intensive labors in his chosen field of chemical industry, constantly devoted notable efforts—in the unassuming way characteristic with him—to the public affairs and welfare of the commonwealth in which he resided. He was, during a quarter of a century, a member of the Municipal Council and President of the Chamber of Commerce. In 1889, Wilhelm Merck's public merits were also formally recognized by his sovereign, who appointed him Privy-Councillor of Commerce and a life member of the First Chamber of the Estates of the Grand Duchy, a body analogous, in that commonwealth, to what in Great Britain is the House of Lords."

Hervey C. Parke, President of Parke, Davis & Co., died on February 8th. The following sketch we take from the *Bulletin of Pharmacy:*

"Beginning life with no other capital than a stout heart, a willing pair of hands and a good name, he ended it the head of a great institution known the world over. Mr. Parke was born the son of a physician in Bloomfield, Mich., and was educated at a private school in his native village. When 16 years old he attended the High School in Buffalo for one year, after which he entered the employ of an upholsterer in that city. Two years later his parents were both the victims of an epidemic, and he returned to his home. Here he taught school for a time, and then was successively a clerk in a hardware store, a clerk in a general store, the financial manager of a mining company and a dealer in mining hardware. Then was started, after these twenty-two years of business success and education, the institution which was to engage his future activities and which was to make his name known to every prescriber and dispenser of medicine in every country on the globe. Duffield, Parke & Co. were successful manufacturers of chemicals in Detroit for four years, when Mr. Duffield's interest was purchased and the firm became known as Parke, Davis & Co. From the small three-story building and the few employes of that time, the business has grown until now three entire city squares are covered with the laboratories of the firm, and over 1,200 employes are engaged in the manufacture of its products—until the services of 130 travelers, scattered throughout the world, are required—until large branch offices have become necessary in the main American cities and in foreign countries. No better monument to the memory of Mr. Parke could be builded than the house of Parke, Davis & Co.

"All through his life Mr. Parke was a liberal philanthropist. He regularly gave a large portion of his income to the support of the Church, and to many public and private charities he was a liberal contributor. Kindly in disposition, modest in demeanor and democratic in spirit, Mr. Parke was beloved by his family, his friends, his business associates and by all who knew him. The humblest employe, if personally known to him, received the same friendly nod of recognition accorded the heaviest stockholders of the corporation. When his death became known about the laboratory there was real sorrow in the heart of every employe who had known him personally, and almost every one could have been found at the funeral services a few days later."